REVIEW AND FORECAST

the OIL AND GAS JOURNAL

For more economical drilling

...it's a Wilson Mogul Roadair "42" Rig

This amazing new Wilson Mogul Roadair "42" Rig was designed to meet the need of those customers who want a rig with compounded engines of up to 400 H.P. total, to drill wells to 5,000 ft. with 4½" pipe, without torque converters and at a lower cost. This rig more completely fills these requirements than any rig known. This rig also offers greater safety and dependability by running two engines, with compound so that either engine can be used should one engine fail. This rig has proven to be a faster, more economical operating rig, at the lowest possible first cost.

Compare Features... Quality... Prices

OUTSTANDING FEATURES:

- Brake Rings—42" Diameter, Brakes 8" wide, full wrap type, cam and roller operated.
- Two-speed Jaw Clutch Transmission, in lieu of Torque Converters.
- Equipped with famous 118 Air-Tube Disc Engine Clutch in positively aligned clutch housing.
- High and Low Speed Air-Tube Disc Drum Clutches.
- V-Belt Compound using High Strength, Steel Cord V-Belts, for High Speed, Large H.P. in narrow width.

Wilson MANUFACTURING CO., Inc.

WICHITA FALLS, TEXAS

PRICE 50 CENTS TABLE OF CONTENTS ON PAGE 1 JANUARY 26, 1953

Features you will like in —

ROCKWELL "201" ORIFICE METERS

LEAKPROOF STUFFING BOX
Has combination bearing and packing made of Teflon. All other parts are of stainless steel. The higher the pressure the tighter the seal, yet Teflon seals without binding and requires no maintenance.

INTERCHANGEABLE HIGH SIDE CHAMBERS
The unit manometer construction permits you to interchange high side chambers easily and adapt any range meter to higher or lower differential requirements. This construction saves stocking spare meters.

ROCKWELL CHART DRIVE
Hermetically sealed. Runs 8 days with one winding. Chart arbor turns once in 24 hours. Turret converters permit chart rotation rate to be changed at will.

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The corrosion resistant pen arms are painted different colors for ready identification. A simple micrometer adjustment is provided for zero setting.

SERVICE CONVENIENCE
Your field men appreciate the extra strong construction—the simplified arrangement of parts—the clean records left by the positive inking pens—the ease with which the meter can be serviced with ordinary tools.

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Battery of six Rockwell orifice meters measuring gas served to compressors in gasoline plant.

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Mechanically calculates up to 300 average charts a day with instrument accurate precision. Produces a verified record of results. Accuracy to within ½ of 1 per cent is practical. Described in bulletin 1016.

ROCKWELL

You Can RELY ON ROCKWELL

THE OIL AND GAS
JOURNAL
Vol. 51, No. 38

NEXT WEEK

- A 24-page special section on the use of electronic computers in the oil industry. Applications to all phases of the industry are shown in the eight timely articles. Among them are:
- Calculation of Crude-Oil Run Tickets.
- Computation of Sand Volumes From Isopach Maps.
- Mechanized Accounting Aids Major Drilling Contractor.
- Computing Gas Volumes From Orifice-Meter Charts.
- Digital Computation of Resistivity-Departure Curves.

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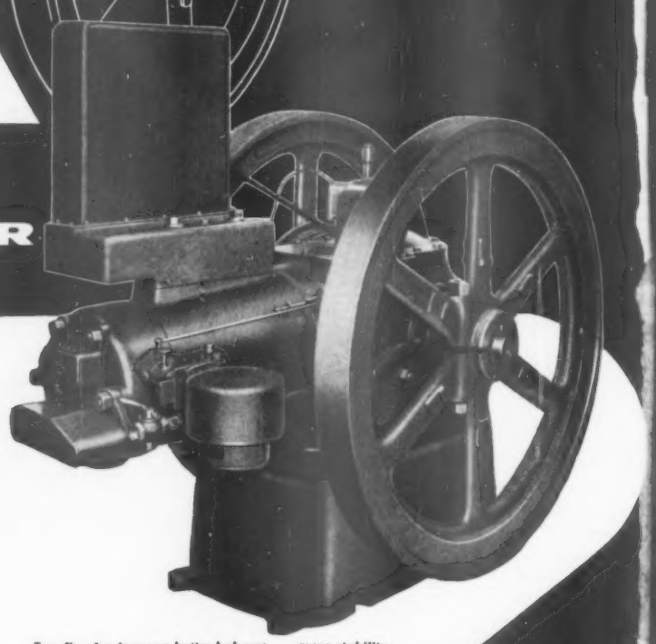
THIS BALANCE ...IS IN YOUR FAVOR



Two flywheels mean better balance . . . more stability on the mounting pedestal. No chance with a "ZC" for unbalanced flywheel effect to cause the engine to work loose from its mounting.

An outstanding performance advantage of the Fairbanks-Morse "ZC" is the *balanced* power output you get with the TWO big flywheels located between the engine and the pumping gear unit. And with TWO flywheels, you can drive from either side of the engine.

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For the complete story on the "ZC," and the broad range of sizes, see your local supply store or write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

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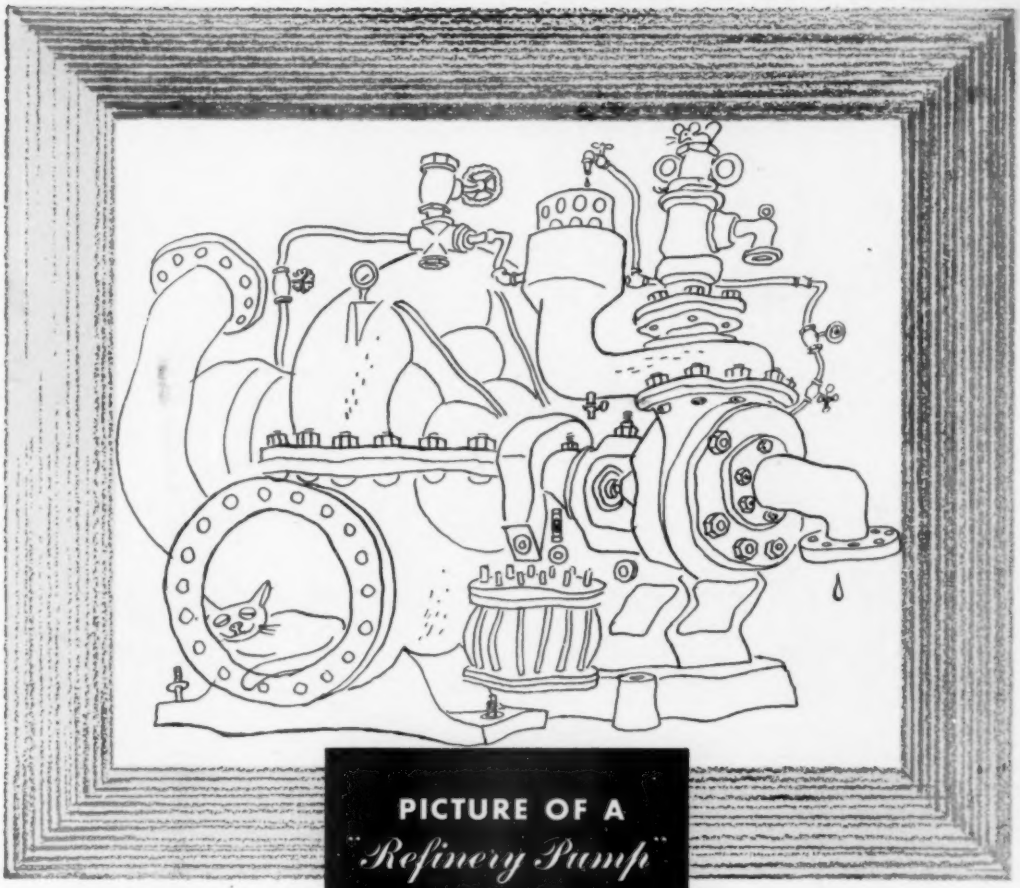

PICTURE OF A "*Refinery Pump*"

"Refinery" pump? There ain't no such animal. But if one pump could be all things to all processes, it *might* look like this. Fact is, however, that in refining *it's pretty important to have each pump fitted to its specialized job.* No *one* answer is good for all.

That's why Byron Jackson builds job-engineered pumps. With a BJ you're sure of a pump that sizes up to the need and is pin-point engineered to profitable performance. Starting with more than 25 basic BJ pump designs used in the refinery field, BJ engineers can incorporate features to meet particular pressure, temperature, corrosive, material or power requirements.

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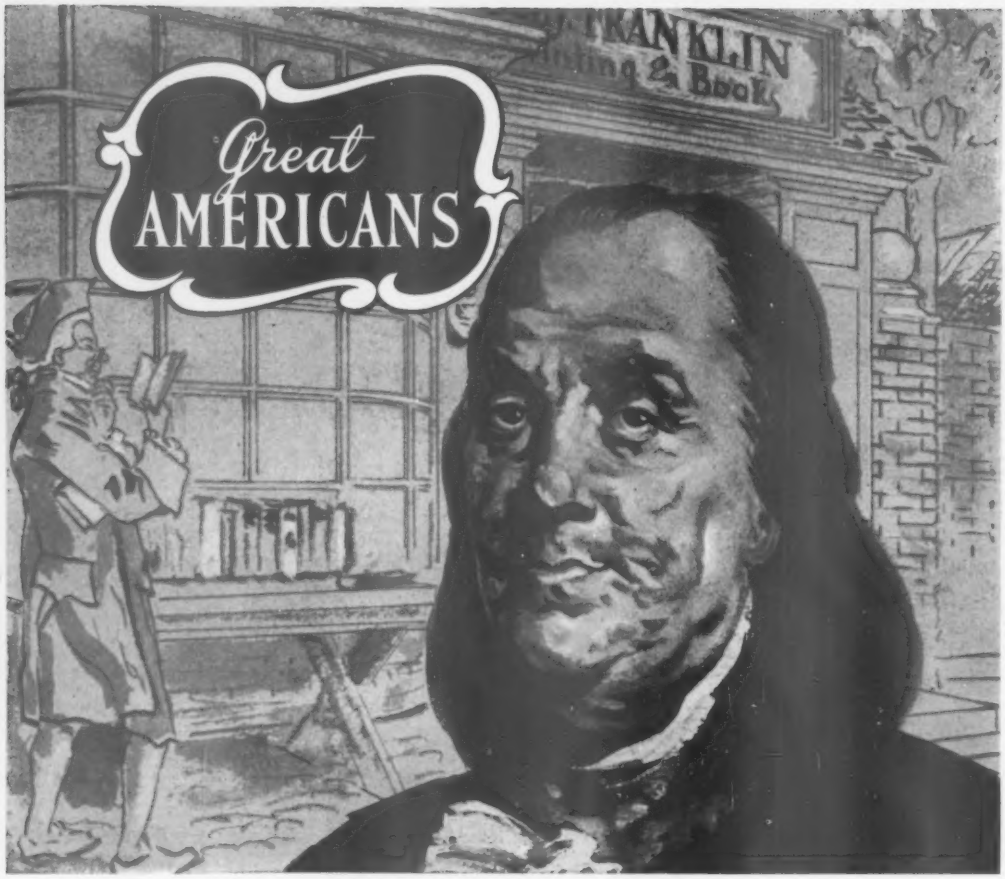
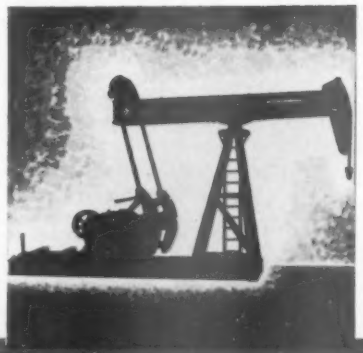


"They that give up essential liberty to obtain a little temporary safety deserve neither liberty nor safety."

—Benjamin Franklin (1706-1790)

AMERICAN PUMPING UNITS are great for holding down operating costs because they pump year after year with almost no servicing or attention. You get highest efficiency on each well by choosing exactly the right AMERICAN Unit from many different combinations of structure and reducer sizes. Write for Catalog 151. Contact your favorite supply store or the nearest American office.



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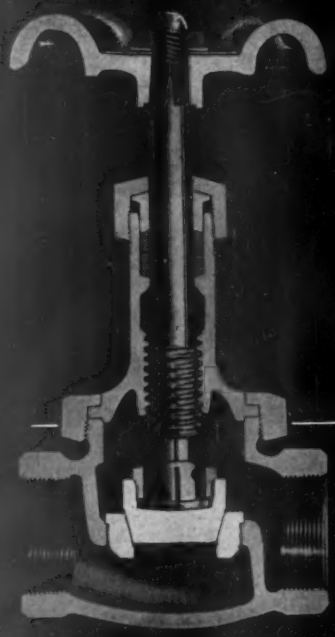

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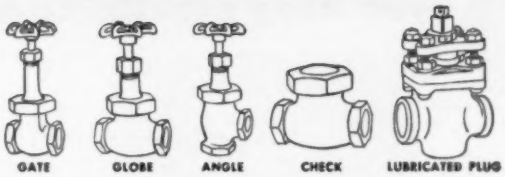
COMPLETE LINES OF BRONZE VALVES AND PIPE FITTINGS are manufactured by Walworth in a variety of types, pressure ratings, sizes, and patterns, including Walseal® Bronze Valves and Fittings for making Silbraz® joints.

Walworth also manufactures complete lines of valves and fittings — including Lubricated Plug Valves — made of steel, iron, and special alloys as well as bronze.

Walworth-made valves, pipe fittings, and pipe wrenches, total approximately 50,000 items—all sold through distributors in principal centers throughout the world.

Walworth engineers will be glad to help you with your problems. For full information call your local Walworth distributor, nearest Walworth sales office, or write to Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



Bronze valves in gate, globe, angle, check, and lubricated plug types are manufactured by Walworth. Illustrated is a sectional view of a Walworth No. 225P Bronze Globe Valve. This valve has a working steam pressure rating of 350 psi at 550F (1,000 psi non-shock cold water, oil, and gas pressure). It features a renewable, plug type, stainless steel seat and disc, heat treated to 500 Brinell hardness.

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Manufacturers since 1842

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Rugged construction, work-speeding features help you keep pipelining on schedule, costs in line

More live weight—All-welded construction plus proper weight distribution provides extra strength without dead weight . . . resists impact and twist . . . simplifies field service.

WHY are more and more pipeliners specifying Link-Belt Speeders? Well, take the 30,000-lb. capacity LS-85 for example: It delivers 92 net hp at full load speed, has self-cleaning crawler treads, Independent Boom Hoist, not to mention outstanding stability. It's fast, maneuverable, yet takes rugged pipelining with a minimum of maintenance.

Like the LS-85, every Link-Belt Speeder combines quality construction throughout with advanced design to speed your work, give you more per equipment dollar.

If you'd like details on this complete line of crawler, truck or wheel-mounted shovel-cranes, ask your distributor or write for Catalog 2373.

LINK-BELT SPEEDER CORPORATION
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Easy to Order! . . .

. . . Quick and Easy to Install!

Grinnell Welding Fittings

Any qualified welder can make welds quickly and easily with Grinnell welding fittings. These fittings are made by a hydraulic forging process that assures uniform wall thickness at all points and true circularity throughout. Of seamless, one-piece construction, they can be cut at any angle to match up with standard weight, extra strong and heavier wall pipe in I.D. or O.D. sizes. Pressure-temperature ratings are equal to or greater than those of seamless steel pipe. Grinnell welding fittings are process stress-relieved.

Full data on the complete line of Grinnell seamless carbon steel welding fittings and forged steel flanges is contained in the Grinnell Welding Fittings catalog. Send for a copy.

GRINNELL
WHENEVER PIPING IS INVOLVED

RANGE OF TYPES AND SIZES

Description	Standard Weight	Extra Strong	Schedule 160	Double Extra Strong	Light Gauge Nominal Pipe Size	Light Gauge Iron Pipe Size
ELBOWS 90° Long Radius	½"-30"	½"-30"	1"-12"	¾"-8"	4"-24"	¾"-12"
90° Long Tangent	1½"-12"	1½"-12"	.....	.....	.....	.....
90° Reducing	2"x¾" to 6"x5"		.....	.....	.....	.....
90° Short Radius	1"-30"	1½"-30"	.....	.....	.....	.....
45° Long Radius	½"-30"	¾"-30"	1"-12"	¾"-8"	4"-24"	¾"-12"
RETURNS 180° Long Radius	½"-30"	½"-30"	1"-12"	2"-8"	4"-24"	¾"-12"
180° Short Radius	1"-30"	1½"-30"	.....	.....	.....	.....
180° Ex. Long Radius	1"-2½"	1"-2½"	.....	.....	.....	.....
TEES — Straight	½"-24"	½"-24"	½"-12"	½"-8"	.....	.....
Reducing Outlet	½"-24"	½"-24"	¾"-12"	¾"-8"	.....	.....
REDUCERS Concentric & Eccentric	¾"-24"	¾"-24"	¾"-12"	¾"-8"	.....	.....
CAPS	¾"-24"	¾"-24"	1"-12"	1"-8"	.....	.....
STUB ENDS — Lap Joint	½"-24"	½"-24"				
SADDLES	2"-24"					
LATERALS — Straight	1¼"-24"	1¼"-24"				
Reducing	1¼"-24"	1¼"-24"				
CROSSES — Straight	1¼"-24"	1¼"-24"				
Reducing	1¼"-24"	1¼"-24"				
BACKING RINGS	2"-24"	2"-24"				

Also available in certain sizes are: 90° long and short radius elbows, 45° long radius elbows and 180° long and short radius returns in Schedules 30, 40, 60 and 80.

Grinnell welding fittings and flanges conform to applicable ASA and ASTM Standards.

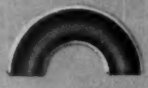
GRINNELL WELDING FITTINGS ARE QUALITY-CONTROLLED FOR DEPENDABILITY

TRUE CIRCULAR SECTION

True circular section at all points makes a Grinnell fitting easy to align and weld . . . there is no distortion or no flattening to affect flow adversely.

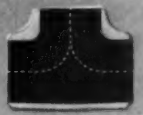
FULL EFFECTIVE RADIUS

The loss of pressure through Grinnell welding elbows is held down to an absolute minimum . . . because of the full and the effective sweep of the radius.



SMOOTH, CLEAN INSIDE SURFACE

Grinnell Fittings have uniformly smooth inner walls . . . no waves or ridges to cause turbulence or accelerate erosion or corrosion. No pockets to trap solids.



EASY, SWEEPING TURNS

In Grinnell welding tees, corners where outlet joins the run are well-rounded and perfectly smooth to minimize resistance to flow and to prevent trapping.

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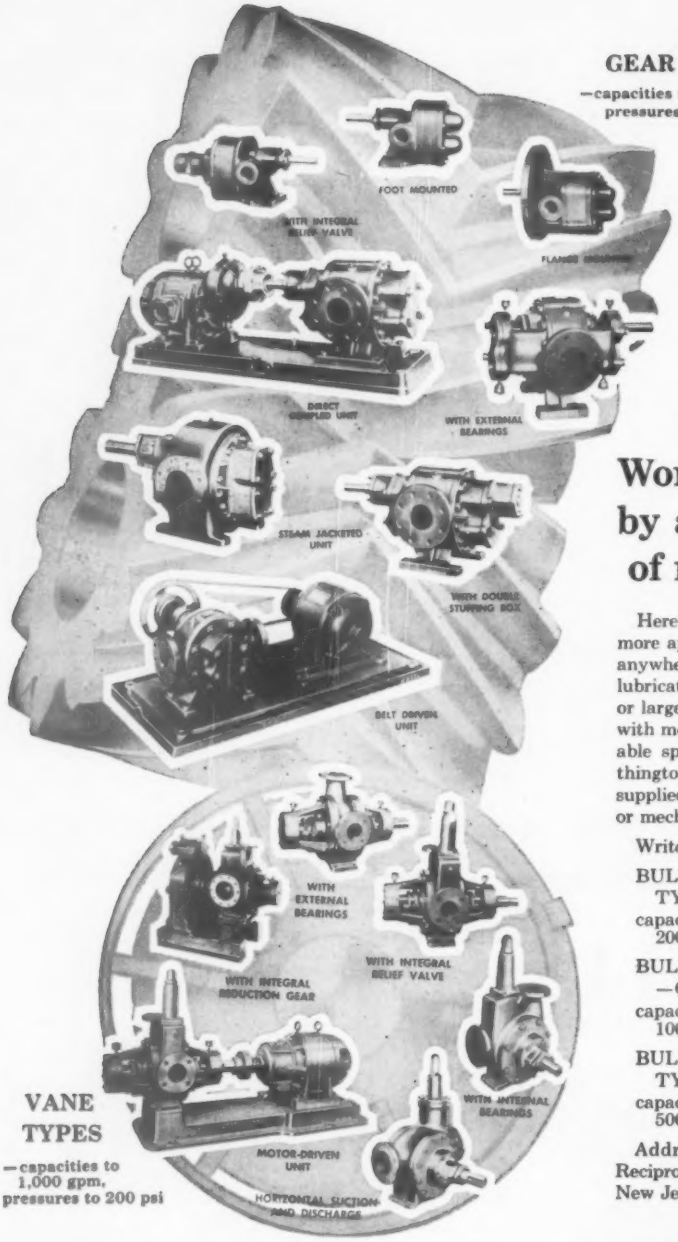

GEAR TYPES

—capacities to 5,000 gpm, pressures to 500 psi

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—capacities to 1,000 gpm, pressures to 200 psi

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BULLETIN W-487-B10C—GEAR TYPES
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P.2.4A

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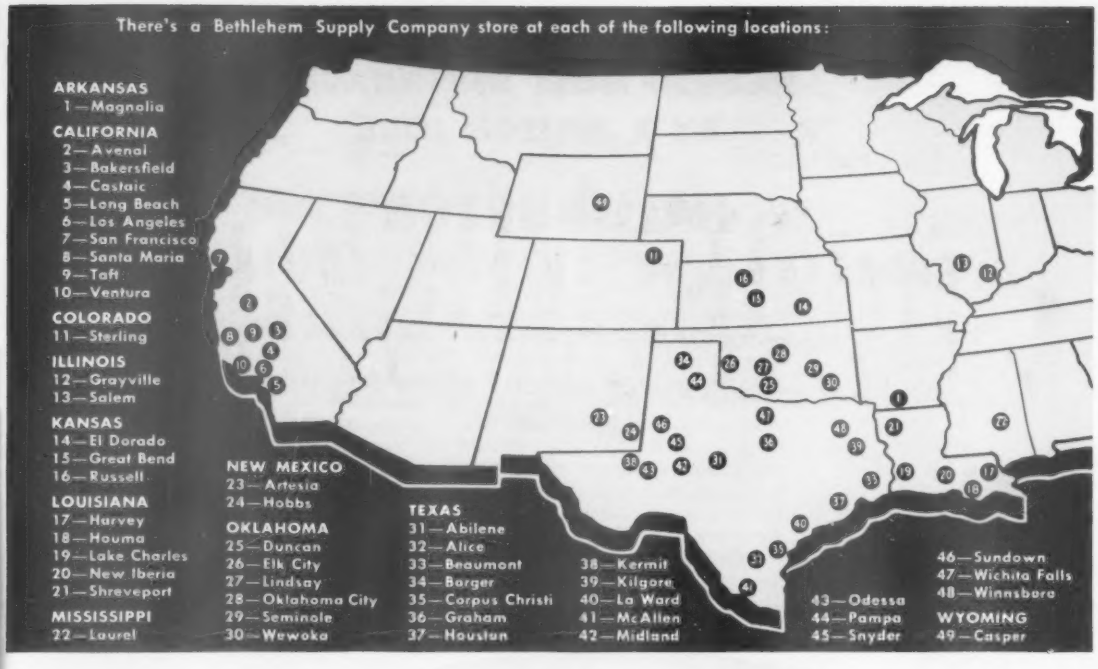

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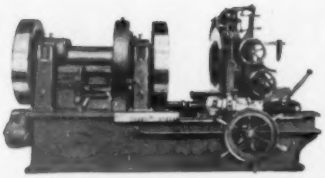

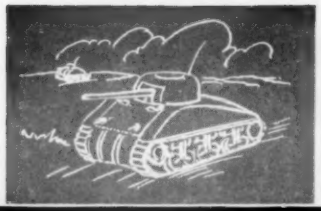

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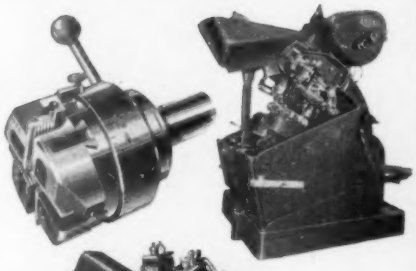
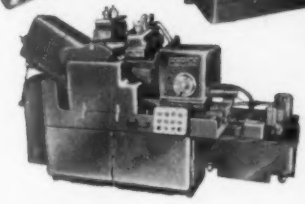
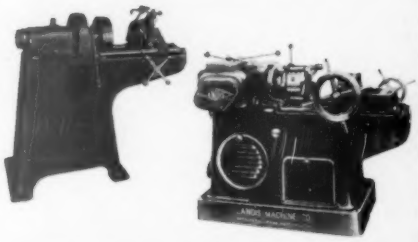
. . . FOR DEFENSE AND PEACE



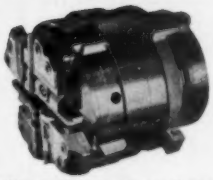




Threads to open bomb doors, or secure warheads on naval rockets—threads to help steer pleasure cars, or to adjust microscopes in research. All of these are produced by one or another of the many types of Landis Threading Equipment, equally adapted to making America strong in war, or building a land of plenty in peace.

Behind this equipment—pipe, bolt, and nipple threading machines, centerless thread grinders, collapsible taps, die heads, chasers—lie years of experience in thread generation and threading equipment manufacture. We offer this know-how to all manufacturers through our Thread Engineering Service. We are ready to help where we can with original thread design, development of threading methods, or adaptation of threading equipment for production. Send us your specifications, or our representative will call at your convenience on request.

LANDIS *Machine* COMPANY · WAYNESBORO PENNSYLVANIA



Represented in the Domestic Oil Fields by: Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas; Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

ANOTHER *Electric Power* CASE HISTORY

72 WELLS PUMPING WITH...

Electric Power

ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY

Our 25th Year

Pump More, for Less in '53 with • PEP

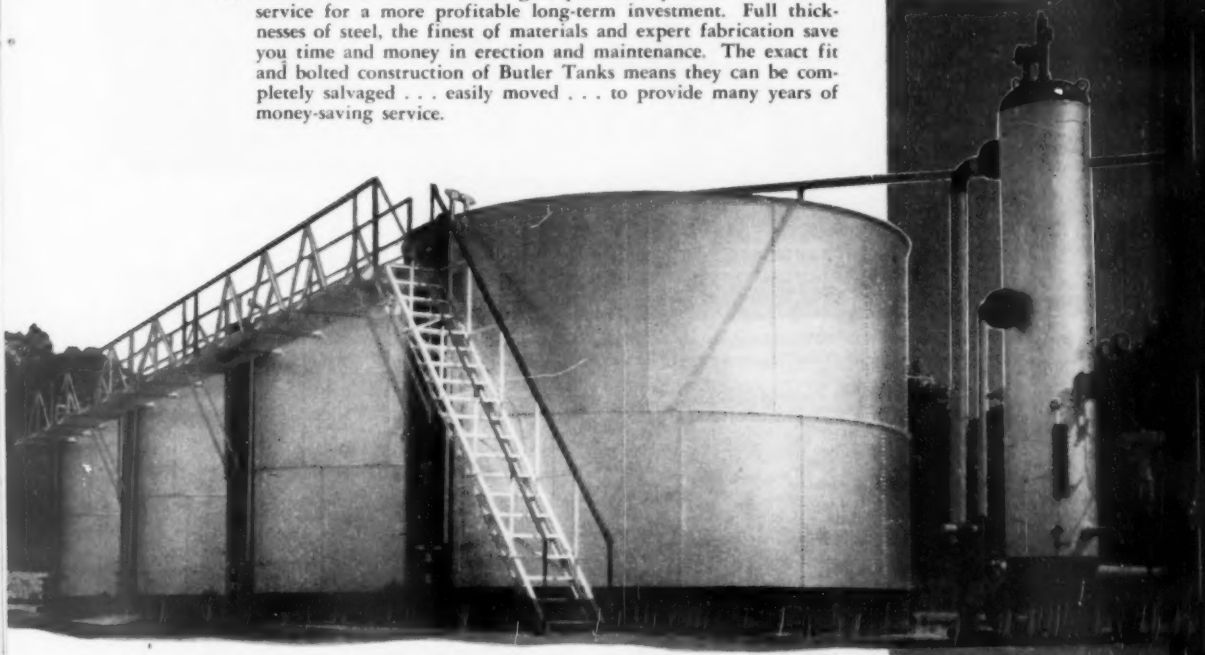
Petroleum Electric Power Association

Get All 3 with BUTLER BOLTED STEEL OIL TANKS

★ **VERSATILITY** Your oil or refined petroleum products will be safely and economically stored in Butler Tanks. All tanks regularly supplied in your choice of two-coat, aluminum-finish coating or galvanized by the hot dip process. Aluminum decks are available for special applications. Capacities 100 to 10,000 barrels.

★ **DEPENDABILITY** Butler Tanks are built to API specifications. All parts are precision-formed to assure oil-tight construction . . . fast easy erection. Butler's half-century of experience in tank engineering and fabrication is your assurance that Butler Bolted Steel Oil Tanks are dependable.

★ **ECONOMY** Butler Tanks give you *extra* years of economical service for a more profitable long-term investment. Full thicknesses of steel, the finest of materials and expert fabrication save you time and money in erection and maintenance. The exact fit and bolted construction of Butler Tanks means they can be completely salvaged . . . easily moved . . . to provide many years of money-saving service.



You'll always get reliable service from your BUTLER distributor . . .

Your Butler distributor is ready to give you dependable, prompt service on Butler Bolted Steel Tanks, Walkways and Stairways, Loading Racks and other oil field equipment. To serve the immediate needs of any oil operation, Butler distributors maintain complete field service, including planning, erection, cutting down and re-erecting. Whatever your storage requirements, your Butler distributor will serve you better.

- **AMERICAN PIPE & SUPPLY CO.**
  Casper, Wyoming
  Denver, Colorado
  Cut Bank, Montana
- **HARRY G. MILLER**
  El Dorado, Arkansas
- **UNION TANK & SUPPLY CO.**
  Great Bend, Kansas
  Tulsa, Oklahoma
  Oklahoma City, Oklahoma
  Hobbs, New Mexico
  Fort Worth, Texas
  Houston, Texas
  Odessa, Texas
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  Tyler, Texas
  Midland, Texas
  Nocona, Texas
  Abilene, Texas
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  Ruston, Louisiana
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  Casper, Wyoming
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BUTLER STEEL PRODUCTS

OIL EQUIPMENT — STEEL BUILDINGS
FARM EQUIPMENT — CLEANERS EQUIPMENT
SPECIAL PRODUCTS

Contact your Butler distributor today or write

BUTLER MANUFACTURING COMPANY

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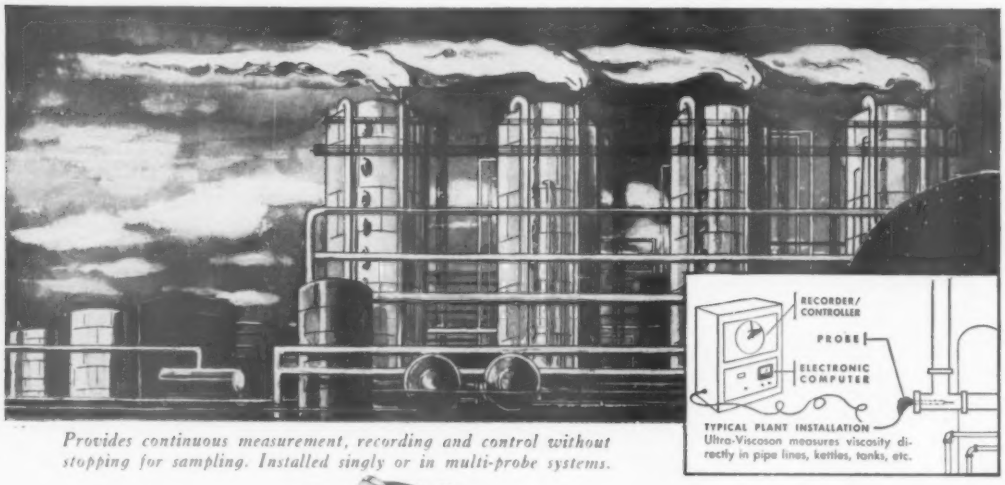
Dept. 64, Richmond, California

PROBE INTO IT...

measure • record • control **VISCOSITY** *continuously*



Provides continuous measurement, recording and control without stopping for sampling. Installed singly or in multi-probe systems.

AUTOMATICALLY MEASURES VISCOSITY WITH ULTRASONICS

- **No moving parts. Simple. Reliable.**
- **Hermetically sealed probe.**
- **Temperature: Up to +650°F**
- **Pressure: Vacuum to 1000 p.s.i. (special units available for higher pressures)**
- **Controls quality: Electrical output of computer actuates recording and control systems.**

Join the increasing number of Ultra-Viscoson users. A partial list includes –

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Monsanto Chemical Co. Plastics Division
Lever Brothers Co.
Bakelite Co., a Division of Union Carbide & Carbon Corp.
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probe into it . . . with

ULTRA-VISCOSON

A product of the Rich-Roth Laboratories.

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1240 Main Street Hartford 3, Conn.

The Surveyor's Notebook

Reporting on Unusual Surveying Problems and Their Solutions

Notekeeper: W. & L. E. Gurley, America's Oldest Engineering Instrument Maker

Comdr. Richard Black headed Antarctic East Base, 1939-41.

Surveying the Antarctic

Surveying uncharted Antarctic areas, engineer reads azimuth with Gurley plane table outfit.

"Since many of us headed straight for the Armed Forces, little was said about the surveys of the U. S. Antarctic Service Expedition of 1939-41," says Richard B. Black, Commander of East Base. "But surveying and mapping were two of our main jobs.

"The work could be done only in the Antarctic summer, from September to March; and, even then, weather was really rough. We were plagued by snow and condensation on our telescope lenses, until the men rigged up deflection hoods for the instruments.

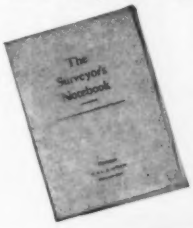
"On the Antarctic Ice Cap, we found the surface very unstable—the slightest movement threw off the instruments. We got around this with a triangular platform of light plank for the tripod, so the men could move about.

"We had Gurley instruments with us at East Base. J. Glenn Dyer, from the General Land Office, built a back harness for carrying his transit up mountains and for skiing. One time, near the Eternity Range, Glenn had just negotiated a high ridge and lost his footing. He slid down an eighth of a mile, wearing through the seats of two pairs of pants. But the Gurley was not damaged at all.

"East Base discovered more than 1500 nautical miles of coastline; mapped and observed 250,000 square miles of new area.

"When it came time to leave, the ice had not broken sufficiently for our ships to get through. So we flew out, leaving valuable equipment behind. When I wound the 30-day clock, I knew it would tick on as the only man-made sound on a lifeless continent. Later, an Argentine expedition found our Gurley instruments and sent them back to the Land Office in Washington. They are now in Alaska, I understand—still doing their job."

An interesting account of Arctic surveying, tips for using instruments under many rugged conditions, and all other stories from the first year's *"Surveyor's Notebook"* series have been gathered together in permanent booklet form. Write for your free copy of *"The Surveyor's Notebook."* Thousands of surveyors are finding it helpful.



When writing for your bound copy of "The Surveyor's Notebook" stories, ask also for Bulletin 50. It gives full details on Gurley instruments.

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W. & L. E. GURLEY, 513 FULTON STREET, TROY, N. Y.

Surveying and Engineering Instruments, Hydraulic Engineering Instruments, Standard Precision Weights and Measures, Paper and Textile Testing Instruments, Reticle Making Facilities, Aeronautical Navigating Instruments, Meteorological Instruments.

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Surveying and Scientific Instrument Makers Since 1845

50-TON HAULS with WAUKESHA *Diesel*

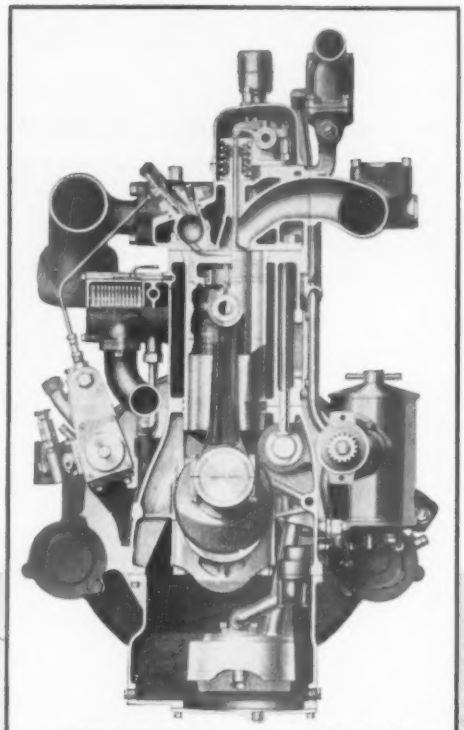
Packed with Power to Pull Heavy Oil Field Machinery

Here's another great Waukesha Oil Field Diesel! It's putting out peak payload performance, hauling heavy oil field machinery . . . as high as 100,000 lb. gross weight . . . for Crail Transportation Co., Long Beach, California. As their president and general manager, Mr. A. W. Swanson says, "This engine has been satisfactory in every way, and has met all our requirements fully."

Like all Waukesha Oil Field Diesels, Model 148-DK has the patented spherical combustion chamber, for clean burning, lively acceleration, shock-free operation, high fuel economy, and low upkeep; and many other exclusive features told in Bulletin 1532.

For every oil field service—Waukesha engines and power units—Diesel, natural gas, butane or gasoline; 10 hp to over 500 hp. Get Bulletin 1079. 188

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.
NEW YORK • TULSA • LOS ANGELES



WAUKESHA High-Duty DIESEL Model 148-DK
six-cylinders, 5¼-in. bore x 6-in. stroke, 779 cu. in. displacement. Peak hp 200.

take a CLOSER LOOK at B&W ALLOY TUBING for high temperature applications

CARBON-MOLY TO CROLOY 9 • CARBON-MOLY • CROLOY ½
CROLOY 1¼ • CROLOY 2 • CROLOY 2¼ • CROLOY 3-M • CROLOY 5
CROLOY 5-SI • CROLOY 7 • CROLOY 9-M

All of these intermediate alloys, developed for oil refinery service, are being used extensively in a wide variety of high temperature applications. All have earned universal acceptance and praise for giving optimum service satisfaction with economy over the years. The accompanying table shows the extensive range of temperature, pressure, corrosion, and oxidation conditions met by B&W Alloy Tubing. Technical data on these analyses is contained in Bulletin TB-12, available upon request. Call on Mr. Tubes—your B&W Tube Representative—to get the benefit of the extensive tubing service he represents, on your specific petroleum processing applications.

CARBON-MOLY—0.50% Mo—For services to 1050F requiring higher creep strength than carbon steel with no increase in corrosion or oxidation resistance.

CROLOY ½—0.60% Cr, 0.50% Mo—For operating conditions to 1075F requiring properties superior to carbon-moly with respect to graphitization and creep strength.

CROLOY 1¼—1.25% Cr, 0.50% Mo, 0.75% Si—Economic grade good creep strength properties up to 1100F. Somewhat more corrosion resistant than chromium-free steels.

CROLOY 2—2% Cr, 0.50% Mo—Economic grade for resisting both oxidation and corrosion, with excellent high-temperature strength, up to 1150F.

CROLOY 2¼—2.25% Cr, 1.00% Mo—Exceptionally high creep strength up to 1175F for polymerization and high pressure cracking. Otherwise similar in properties and characteristics to Croloy 2.

CROLOY 3-M—3% Cr, 0.90% Mo—Somewhat better creep properties, and resistance to corrosion and oxidation up to 1175F than Croloy 2.

CROLOY 5—5% Cr, 0.50% Mo—For operating conditions up to 1200F where corrosion resistance is a primary requirement—with creep strength and oxidation resistance superior to Croloy 2.

CROLOY 5-Si—5% Cr, 0.50% Mo, 1.50% Si—For operating conditions up to 1300F where oxidation resistance is a primary requirement. Excellent resistance to scaling under straight oxidizing conditions.

CROLOY 7—7% Cr, 0.50% Mo, 0.50-1.00% Si—For operating conditions up to 1250F where corrosion resistance is the primary requirement. Somewhat more oxidation resistant than Croloy 5.

CROLOY 9-M—9% Cr, 1% Mo—For severe operating conditions up to 1300F where high corrosion and oxidation resistance are essential as in hydrogenation processes.

Steels from CROLOY 1¼ upward are electric furnace alloy steels which are normally cleaner and of better quality than open hearth steels. This contributes to greater reliability and improved creep properties at elevated temperatures.

B&W SEAMLESS and WELDED TUBES

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
General Offices & Plants
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

Sales Offices: Beaver Falls, Pa. • Boston 16, Mass. • Chicago 3, Ill.
Cleveland 14, Ohio • Denver 1, Colo. • Detroit 26, Mich. • Houston 19, Texas
Los Angeles 17, Cal. • New York 16, N. Y. • Philadelphia 2, Pa.
St. Louis 1, Mo. • San Francisco 3, Cal. • Syracuse 2, N. Y.
Toronto, Ontario • Tulsa 3, Okla.

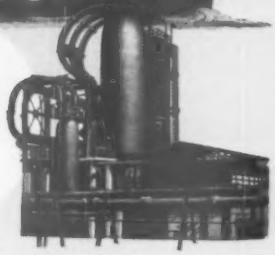
TA-1685

Prevent moisture contamination of petroleum products

HERE . . .

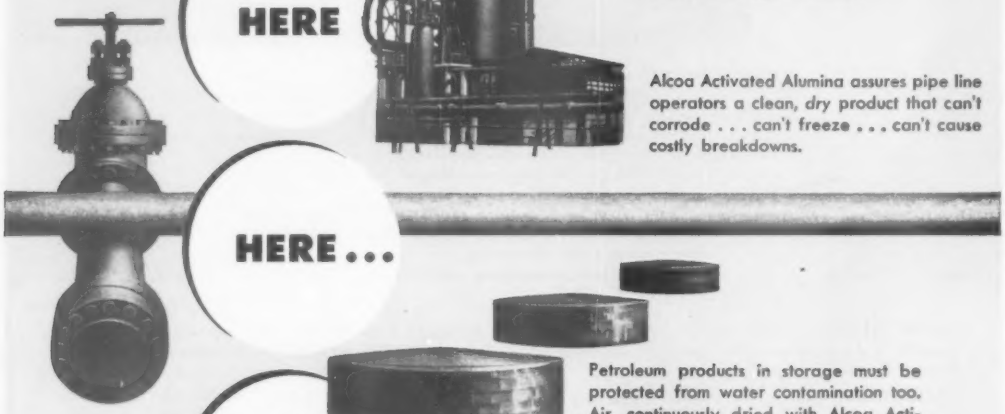
Oil tankers carry dehydration units containing Alcoa Activated Alumina to keep crude and finished oils constantly *dry* while in transit.

HERE



Refineries dry everything from instrument air to liquid propane with Alcoa Activated Alumina—to guard against corrosion, rusty lines and clogged valves.

HERE . . .



Alcoa Activated Alumina assures pipe line operators a clean, *dry* product that can't corrode . . . can't freeze . . . can't cause costly breakdowns.

AND HERE WITH

Petroleum products in storage must be protected from water contamination too. Air, continuously dried with Alcoa Activated Alumina, blankets oil in storage tanks, prevents entry of outside moisture.

ALCOA Activated* ALUMINA

ALCOA Activated Aluminas are among the most efficient desiccants available to the petroleum industry for the dehydration of liquids, gases and gaseous hydrocarbons. Dew points as low as *minus* 100° F.—and even lower—may be obtained. Under normal circumstances ALCOA Activated Aluminas can be used for an almost indefinite number of drying cycles.

ALCOA Activated Alumina is non-corrosive . . . resists shock, abrasion and erosion . . . will not change its form or properties. Perhaps dehydration with this commercially pure aluminum oxide can speed up *your* operations—protect *your* products from costly moisture contamination. Write for details today. ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 718-A Alcoa Building, Pittsburgh 19, Pennsylvania.

Reg. T. M. Aluminum Co. of America

Alcoa Chemicals

ALCOA

ALUMINAS and FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • HYDRATED ALUMINAS • TABULAR ALUMINAS • LOW SODA ALUMINAS ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE • GALLIUM

25/1,000,000 of an inch

. . . rigid manufacturing standard for tough drilling service

Although the extreme forces which affect drilling string performance are pretty well known, there is still no perfect way for scientists and engineers to "see" what goes on thousands of feet underground.

So the next best way to assure maximum drill string performance is to study drill pipe which has stood the test in deep drilling operations and then improve upon it—keeping constantly ahead of the most exacting demands of the industry.

That's why manufacturing tolerances of 25/1,000,000 of an inch were adopted at National Supply for precision-finishing of tool joints. It's a matter of fact that Spang Tool Joints fit perfectly, and stand up under the most rigid service—though few who use them are aware of the many skills employed in making them and the extreme care with which they are tested.

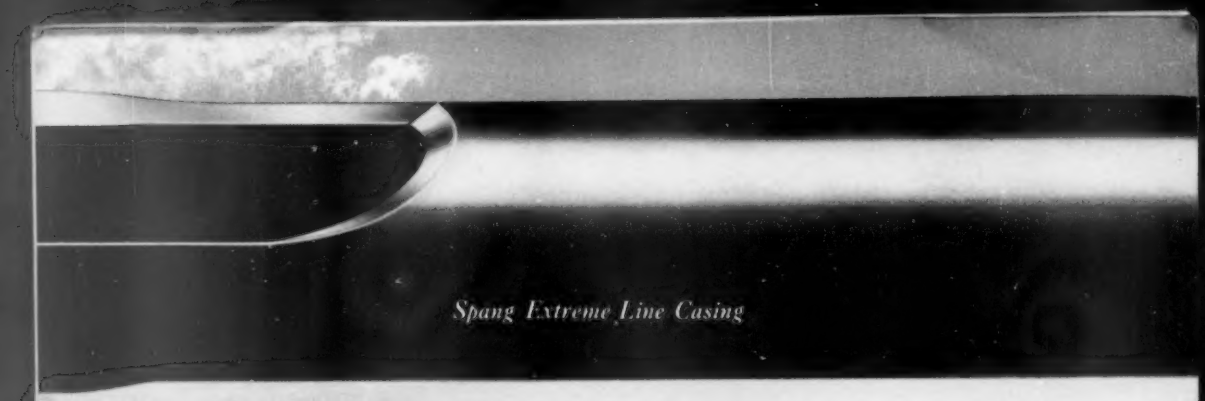
And that's equally true of all the products of National Supply—there's more stamina built into them than most operators ever will get out of National drilling and production machinery. You'll see proof of this, and learn many of the reasons why, when you visit National's exhibit at Tulsa in May. The location will be the same but everything else will be the newest and latest.

THE NATIONAL SUPPLY COMPANY

PITTSBURGH 30, PENNSYLVANIA

NATIONAL BLUE PRODUCTS

Spangseal Tubing
Spang Tubular Products
Spangweld Drill Pipe



Spang Extreme Line Casing

. . . by any standard of comparison they measure up to maximum service requirements

Throughout its many years of service to the petroleum industry the Spang-Chalfant Division of National Supply has been the source of the most complete range of oil country tubular products, and the most advanced in engineering, metallurgy and manufacturing.

The long list of tubular products bearing the Spang trademark is evidence of the research and continuous product development carried out at the Ambridge, Pennsylvania, laboratories, and throughout the world of oil with which National's field organization is in daily contact.

Thus the introduction of new Spang tubular products, such as Spangseal Tubing and Spangweld Drill Pipe, is further indication that National's equipment development program is keeping pace with the petroleum industry's demands.

By any standard of comparison your investment in drill pipe, casing, or tubing bearing the Spang Trademark is your assurance of adequate returns in serviceability, and trouble-free performance. The latest bulletin on Spang drill pipe and tool joints contains valuable information you'll want for your reference files—write Pittsburgh for your copy.

NATIONAL BLUE PRODUCTS

Spang-Chalfant Division

THE NATIONAL SUPPLY COMPANY

PITTSBURGH 30, PENNSYLVANIA

Division Tubular Offices: Denver, Colorado • Houston, Texas • Fort Worth, Texas • Los Angeles, California • Pittsburgh, Pennsylvania Tulsa, Oklahoma • Calgary, Alberta, Canada

Spang Double Seal Shrink Thread Drill Pipe and Tool Joints

Sets its own standard for comparison...

Years have passed since the first Spang Extreme Line Casing was run.

But since that time, deeper penetrations have created new problems in deep well completion. Under these new conditions Spang Extreme Line Casing has set its own standards by which the economics of casing performance can be judged.

Since economics is only one critical standard by which oil well casing is usually judged, it is important to note the proof, obtained from reports of installations in hundreds of wells, that—

Spang Extreme Line Casing has the mechanical and metallurgical strength to withstand the high tensile loading, and to resist the extreme pressures, found in present day deep well operations.

Our representatives will be glad to discuss specific problems on the application of any of the Spang Oil Country Tubular Products.

Spang-Chalfant Division

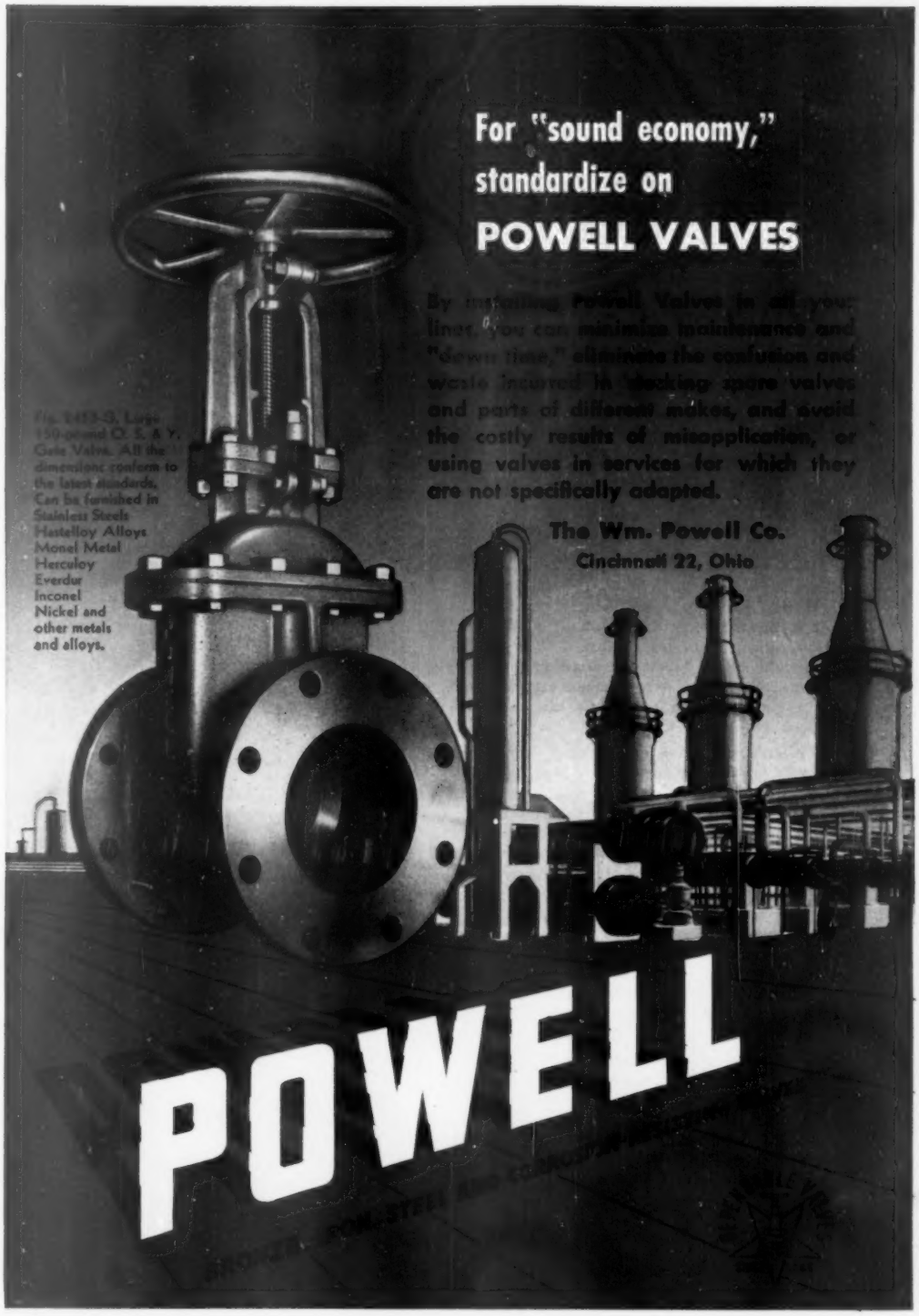
THE NATIONAL SUPPLY COMPANY

PITTSBURGH 30, PENNSYLVANIA

Division Tubular Offices: Denver, Colorado • Houston, Texas • Fort Worth, Texas • Los Angeles, California • Pittsburgh, Pennsylvania Tulsa, Oklahoma • Calgary, Alberta, Canada

National Oil Field Machinery and Equipment
Spang Steel Pipe • Superior & Atlas Engines

NATIONAL BLUE PRODUCTS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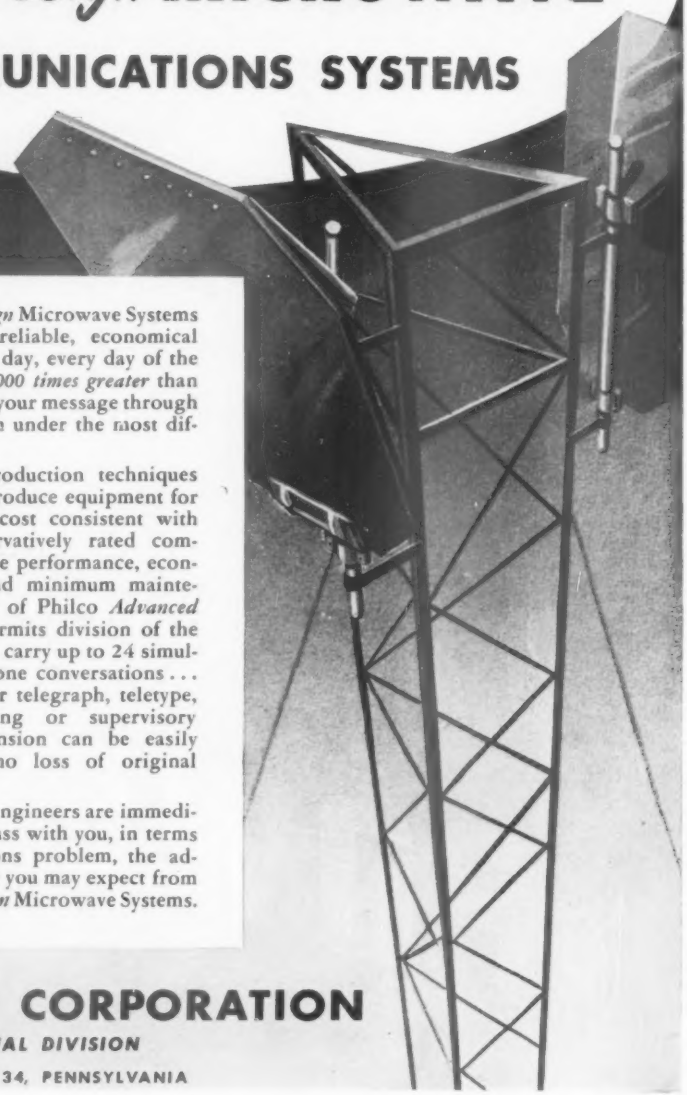
POWELL VALVES
By installing Powell Valves in all your lines you can minimize maintenance and "down time," eliminate the confusion and waste incurred in stocking spare valves and parts of different makes, and avoid the costly results of misapplication, or using valves in services for which they are not specifically adapted.
The Wm. Powell Co.
Cincinnati 22, Ohio
Fig. 2453-B, Large 150-pound O. S. & Y. Gate Valve. All the dimensions conform to the latest standards. Can be furnished in Stainless Steels Hastelloy Alloys Monel Metal Herculoy Everdur Inconel Nickel and other metals and alloys.
POWELL

Don't Settle for Less Than . . .

PHILCO

Advanced Design MICROWAVE

COMMUNICATIONS SYSTEMS



Philco *Advanced Design* Microwave Systems are engineered for reliable, economical operation 24 hours a day, every day of the year. A signal level *1000 times greater* than normally needed gets your message through clear and strong, even under the most difficult conditions.

Philco's exclusive production techniques make it possible to produce equipment for the lowest possible cost consistent with high quality. Conservatively rated components insure reliable performance, economy of operation and minimum maintenance. The flexibility of Philco *Advanced Design* Microwave permits division of the broadband channel to carry up to 24 simultaneous 2-way telephone conversations . . . or further division for telegraph, teletype, telemetering, signaling or supervisory circuits. Future expansion can be easily accomplished with no loss of original investment.

Philco regional sales engineers are immediately available to discuss with you, in terms of *your* communications problem, the advantages and economy you may expect from Philco *Advanced Design* Microwave Systems.

PHILCO CORPORATION

INDUSTRIAL DIVISION

PHILADELPHIA 34, PENNSYLVANIA

The practical way to save pipes, tanks, derricks, buildings, pumps, roofs, fences

STOP RUST!

with

RUST-OLEUM

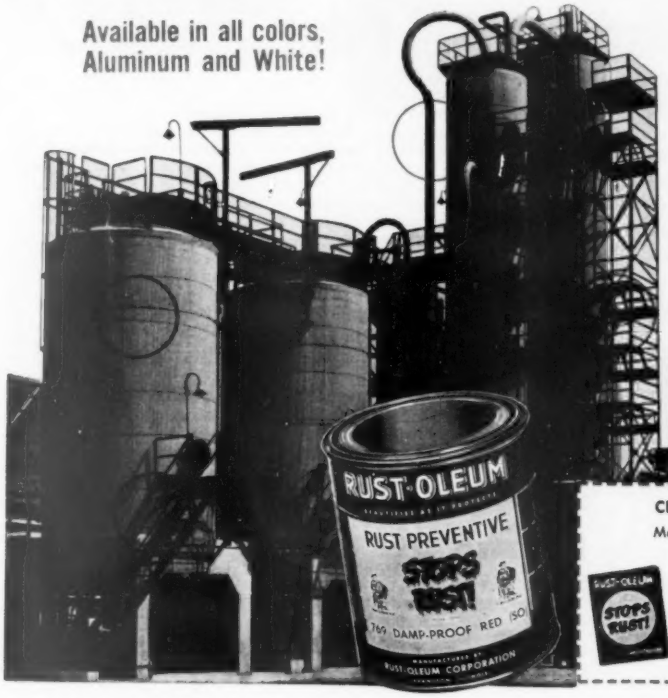
May be applied directly over rusted surfaces without removing all the rust!

RUST-OLEUM is the *practical, sensible* answer to your rust problems. Cuts your maintenance costs, because it may be applied *directly over rusted surfaces* after wirebrushing and scraping with sharp scrapers to remove rust scale and loose particles . . . costly sandblasting and chemical pre-cleaning are not usually required. This often enables *one man* to do the work of two with RUST-OLEUM! Practical, too . . . because RUST-OLEUM beautifies as it protects in *all colors, aluminum,* and *white.*

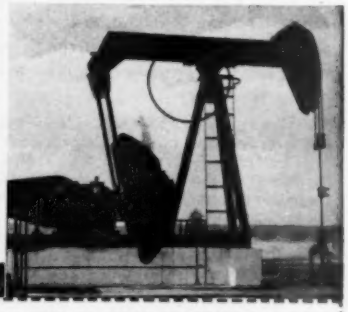
We'll be happy to show you convincing proof that RUST-OLEUM can cut your maintenance costs . . . and last longer when applied over rusted surfaces. Get the facts, today! Prompt delivery from Industrial Distributor stocks in principal cities in the United States and Canada.

RUST-OLEUM CORPORATION
2541 Oakton Street, Evanston, Illinois

Available in all colors, Aluminum and White!



See Rust-Oleum Demonstrated
Booth 1237
Plant Maintenance Show
Cleveland, Ohio



CLIP THIS TO YOUR LETTERHEAD

Mail To: Rust-Oleum Corporation
2541 Oakton Street
Evanston, Illinois

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- ☐ Have A Qualified Representative Call
- ☐ Full Details On Free Survey
- ☐ Complete Literature
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From time card to travel ticket

Every angle completely covered . . . but one! When fire strikes during the night your skilled labor may go in the morning. The fully experienced Joes, Bills and Toms can't stand the financial strain of waiting . . . their time cards can become travel tickets to new jobs, while you're struggling to replace the ravages of fire.

The threat of losing your skilled labor due to an unexpected fire tragedy can be fully eliminated. With C-O-TWO Smoke or Heat Fire Detecting Systems plus C-O-TWO High Pressure or Low Pressure Carbon Dioxide Type Fire Extinguishing Systems your plant can have fast, positive, round-the-clock fire watchman service simultaneously at each fire hazard point.

At locations where a deep-seated, smoldering internal fire as well as a fast burning external fire might occur, the smoke detector of a C-O-TWO Smoke Fire Detecting System, based on an exclusive operating principle, automatically detects the first trace of smoke, smoldering or fire.

For locations where excessive heat or combustion might cause a flash fire, the heat detectors of a C-O-TWO Heat Fire Detecting System automatically sound a warning at the first flash of fire.

Then clean, dry, non-conducting, non-damaging carbon dioxide is instantly released from either a C-O-TWO High Pressure or Low Pressure Carbon Dioxide Type Fire Extinguishing System into the threatened area. The fire is out in seconds with little if any interruption to operations and the carbon dioxide disappears without a trace . . . one of the safest fire extinguishing agents known . . . harmless to equipment, materials and finishes.

WHEN BUSINESS STOPS . . . INCOME STOPS!

Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today . . . our extensive experience over the years is at your disposal without obligation. Get the facts now!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
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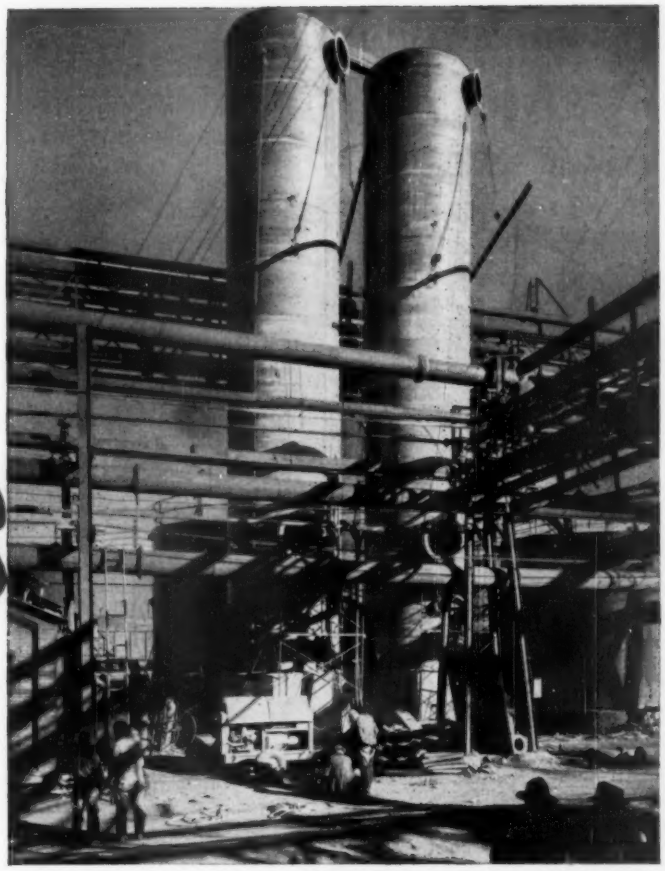
56-Foot
Cooling Towers

60 days

from inquiry to operating installation!



Primary and secondary cooling towers, 10½ feet inside diameter and 56 feet high, as erected and ready for connection to the by-product recovery system of a midwestern coal coking plant.

A.O.Smith manufactures plain as well as complex vessels for customers around the world. The plain vessel takes less time to build, as indicated by the short interval of 60 days that elapsed from the time the customer's inquiry was received to the day the cooling towers went into operation.

The cooling towers were built from the customer's blueprints, in cooperation with A. O. Smith engineers. They are thin-wall, low-pressure vessels, field erected by our customer, within a maze of piping, where field welding united the sections.

Gases from the coking ovens are now being cooled in the two stages provided by these towers. Increased production of the by-product coke plant is now a reality.

A. O. Smith welcomes every opportunity to consult with you on vessel requirements for your processing.

Research and engineering teams, supported by data and vessel-design experience, accumulated through more than 75 years, can solve your vessel problems and aid you in your processing plan.

Your inquiries will receive prompt and expert handling.

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WITH HEAT EXCHANGER PROBLEMS

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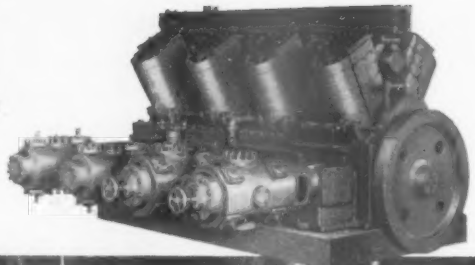
at Snyder Plant of

STANDARD OIL COMPANY of TEXAS



7 VETERAN (16 years old) XVG's + 8 MODERN SVG's = 5340 hp of trouble-free casing head gas compression

The 15 Ingersoll-Rand gas-engine-driven compressors shown above include seven XVG units which have been in almost continuous operation since 1936 . . . plus eight modern-design SVG units. The XVG's were moved to Snyder Plant in West Texas from an old plant in Ward County, requiring remarkably little work at the time of relocation.

Old and new units alike are all giving *excellent service,* compressing casing head gas to 465 psig pressure for delivery to the absorbers.

The seven XVG's are rated at 260 hp each and the eight SVG's at 440 hp each—a total of 5340 hp.

Ask your Ingersoll-Rand representative for complete information on gas-engine compressor performance and economy.

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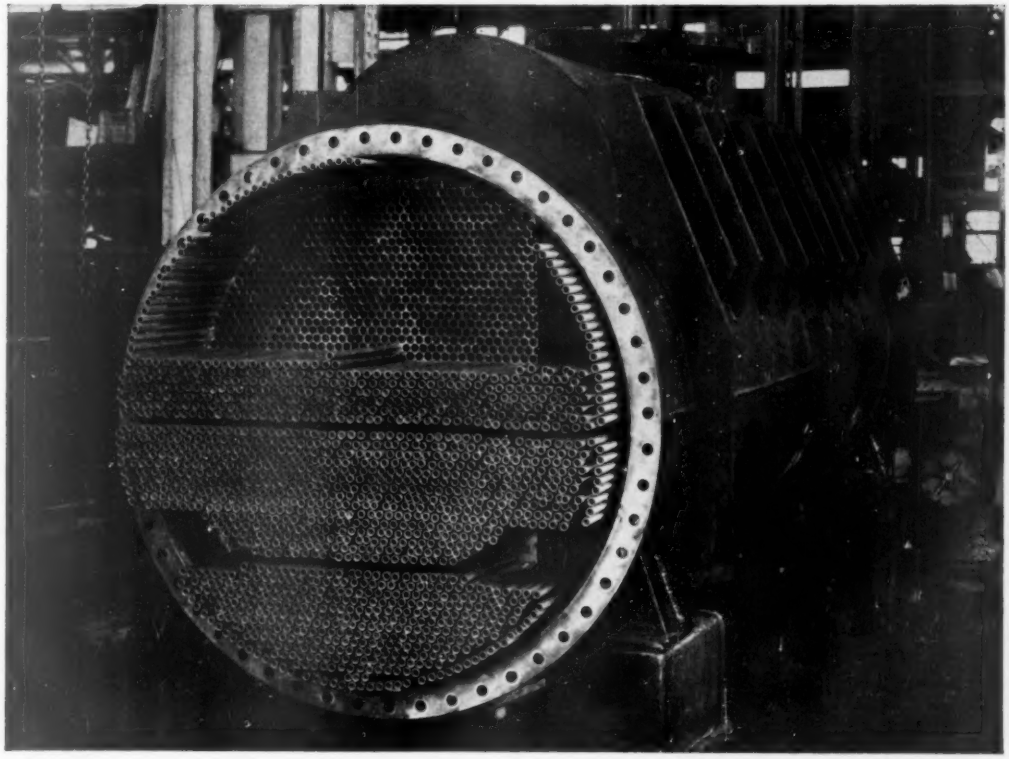
COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

They're ANACONDA tubes— placed in new Gulf installation



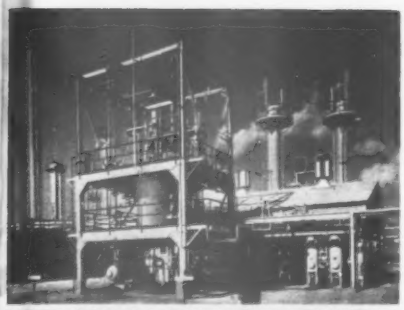
When this partially assembled heat exchanger was completed, it was installed as the surface condenser for a new vacuum still recently completed at Gulf Oil Corporation's Port Arthur, Texas refinery. The condenser was built by the Kewanee-Ross Corp., for M. W. Kellogg Co., the designing engineers and contractors.

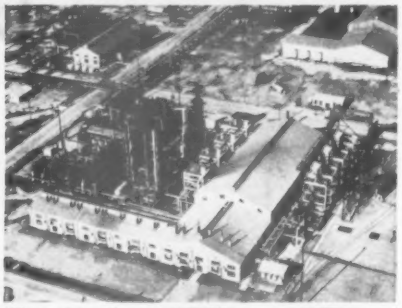
Kellogg engineers approved ANACONDA Arsenical Admiralty Tubes for this particular equipment for one of the country's largest and most modern refineries. Tube dimensions are ¾ in. O.D. x .065 in. x 16 ft. long. The tube sheets are ANACONDA Naval Brass 56¾ in. diam. x 2 in. thick.

What alloy should you specify for your heat exchanger tubes? It all depends...on cooling water characteristics...on operating conditions . . . on many factors. But for sound counsel on the most economical alloy for your specific installation, draw on Anaconda's broad technical experience in all types of heat exchanger and condenser operation problems. Our Technical Department's services are always freely available to your technicians. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario. 52187

for efficient heat transfer **ANACONDA**® heat exchanger tubes

HERE ARE 5 REASONS WHY YOU SHOULD TALK TO M. W. KELLOGG ABOUT Petrochemicals Processing...





1 NEW PROCESSES AVAILABLE . . .

Using new processing techniques, Kellogg is now in a position to design plants for the production of a wide variety of valuable chemicals from hydrocarbon feeds. As a result of recently completed arrangements these include, for example, urea via Montecatini's vastly improved process. Others are ammonia, phenol and acetone, aromatics, higher aliphatic and cyclic alcohols, and phthalic anhydride.

2 CURRENT PRACTICAL DESIGN EXPERIENCE . . .

Today, with nearly a score of different chemical plants either under construction or in engineering, Kellogg is able to offer broad chemical experience—all based on the practical chemical engineering philosophy of continuous processing in integrated plants.

3 EXTENSIVE LABORATORY FACILITIES . . .

Kellogg pilot plant and organic laboratory facilities are among the most extensive in the industry. The firm is well known among the process industries for its ability to cooperate closely in the development of new proc-

esses—and for its engineering know-how in the translation of pilot plant and semi-commercial plant data into profitable commercial operations.

4 PETROCHEMICAL BACKGROUND . . .

Since World War II when Kellogg engineered butadiene and ammonia plants . . . and later, special units for the production of ethylene, hexylene glycol and ethyl chloride as well as highly efficient fractionation systems for the concentration of butylene . . . the company has continued its research and development work in this expanding field.

5 BASIC ENGINEERING DATA . . .

Behind the relatively new developments in chemical processing, Kellogg has a vast reservoir of technical data built up over years of designing, engineering and erecting petroleum refineries all over the world. Much of this experience is directly applicable to chemical process design.

• • •

If you have a refinery by-product that you wish to upgrade in value to petrochemical intermediate or final product, consider Kellogg's *practical* experience. Write—

Chemical Process Division

THE

M. W. KELLOGG COMPANY

KELLOGG — A DIVISION OF PULLMAN INCORPORATED

for fifty one years an integral part of processing history!

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These current projects demonstrate Kellogg's versatility in the chemical field . . .

AMMONIA
ISO-OCTYL-ALCOHOL
PHENOL
AROMATICS

In the United States

For Shell — An anhydrous ammonia plant for the West Coast.

For Standard Oil Co. (Indiana) — An iso-octyl-alcohol plant now under construction in the midwest.

For Pan-Am Southern — The first Fluid Hydroformer. Although scheduled to upgrade naphthas to high grade motor gasoline, the unit can alternatively produce aromatics such as benzene, toluene and xylene.

For Cities Service — Two more Fluid Hydroformers, one for the Midwest and the other for the Gulf Coast.

SEVEN PLANT COMPLEX

In Italy for Montecatini—Seven important units for the production of ethylene, propylene, and butylene as well as final products such as isopropanol, secondary butanol and phthalic anhydride.

PHENOL FROM CUMENE

In Canada for B-A Shawinigan — The World's first phenol-from-cumene plant. Scheduled for completion early next year, it promises to provide high quality phenol at low cost.

NAPHTHA PYROLYSIS

In England for ICI— Just completed, a naphtha pyrolysis plant producing better than 99.8% pure ethylene as well as useful by-products such as propylene and butylene. Also for ICI, a phthalic anhydride unit, now in engineering.

GASOLINE FROM COAL SYNTHESIS

In South Africa for SASOL—A large gasoline-from-coal synthesis plant employing Kellogg's Synthol process. Special separation equipment to recover valuable alcohols and other oxygenated chemicals is part of the program.

Ordinary steels do not pass the high requirements set for Jones sucker rods. Only carefully selected steels that meet laboratory tests are acceptable. What's more, they must pass a series of controls throughout fabrication. This is another assurance of uniform quality when you run the green rods.

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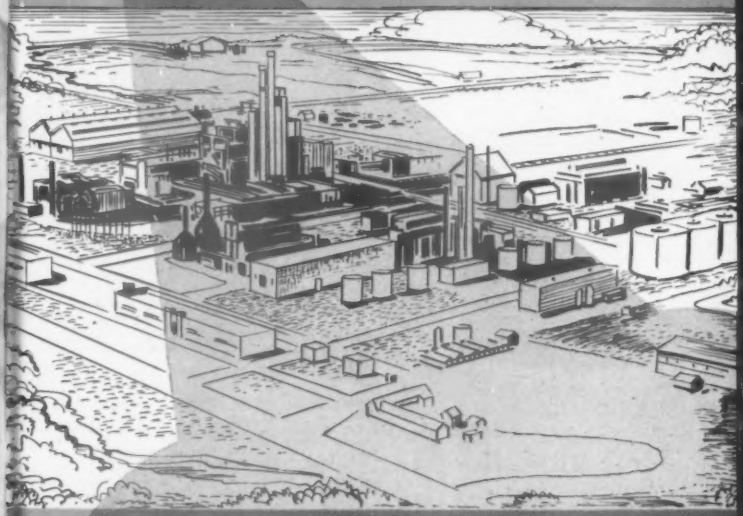
30 YEARS OF PROGRESS WITH THE OIL INDUSTRY

A STEAM TRAP CASTS A

BIG effects from little traps! And, the effects are multiplied by the number of traps in the plant you design or operate until they grow to be a *major* influence upon operating efficiency and economy. Before you specify steam traps ask your nearby Armstrong Representative to call. He is qualified to give you practical assistance and answers that can save you a lot of time and trouble.



THINGS STEAM TRAPS AFFECT

1. **HEAT-UP OR START-UP TIME**
2. **RATE OF PRODUCTION**
3. **STEAM WASTE**
4. **FUEL WASTE**
5. **CONTINUITY OF OPERATION**
6. **MAINTENANCE COST**

Cast semi-steel side inlet — side outlet series. ½", ¾" and 1" pipe connections.

Cast semi-steel bottom inlet — top outlet series. ½", through 2" pipe connections.

Forged steel series for high pressures to 1500 psig and for low and medium pressures where all-steel fittings are desirable.

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It Pays to Specify

ARMSTRONG

MIGHTY BIG SHADOW

REASON	HOW ARMSTRONG TRAPS MEET THE NEED	EXAMPLE
When steam is turned on, large amounts of condensate *and air* must be removed before equipment heats up.	Condensate *and air* removed as fast as they reach trap. Reliable data insures you get trap with adequate safety factor to meet conditions.	*40 Minute Faster Heat-up*—drying oven at pharmaceutical plant heats up 40 minutes sooner with Armstrong "Blast" traps.
Quick heat-up, maximum temperatures essential for maximum output.	Air which reduces temperature and heat transfer discharged automatically; condensate discharged at steam temperature; equipment kept *full* of hot, dry steam.	*30% Greater Output* — jacketed kettles produce 30% more at Canadian plant since changing to Armstrong traps.
When steam gets past traps, boiler capacity may be inadequate—this is bad even if you could afford the fuel waste.	When steam floats the bucket the trap closes. No steam ever reaches discharge orifice, even when there is no condensate load. Heat treated chrome steel valve parts, precision ground and lapped, resist wire drawing and wear, stay leak tight for a long, long time.	*Steam Savings Eliminate Need for New Boiler*—chemical plant shelves plans to buy larger boiler after installing Armstrong Traps.
Why burn fuel to generate steam that does no useful work . . . blows through traps, for example?		*33⅓% Reduction in Fuel Bill* — after trapping vats with Armstrongs at Missouri plant.
When traps are inoperative or down for repairs, unit being drained may be "off the line."	Nothing to clog, seize, stick or collapse! Large orifice. Self-scrubbing action cleans out ordinary dirt and scale. "Frictionless" leverage with wear points heavily reinforced for long life. Hardened chrome steel valve and seat. Wear and corrosion-resistant stainless trim.	*Maintenance Time Cut 30%* — Illinois user says, "Unequalled dependability, simplicity of design means repairs can be made quickly" (with minimum equipment downtime).
Traps that don't "wear well" take a lot of manhours for repair.		*50% Less Trap Maintenance* — only half as many manhours devoted to traps since installing Armstrongs throughout large Midwestern plant.

SEND FOR THE *NEW* ARMSTRONG STEAM TRAP BOOK

Fresh off the press — 44 pages of practical trapping data. Tells how to select traps for nearly every class of equipment; explains safety factors; gives prices, physical data, service pressure ratings of Armstrong traps; includes recommended installation, maintenance and trouble-shooting practice; contains many time-saving charts and tables — condensing rates, trap capacities, trap size recommendations and others. For your free copy, call your local Armstrong Representative or write to Armstrong.

STEAM TRAPS

Saving weight and space was vital in the building of this vacuum tank truck—used to pump and haul away mud, water and waste oil from sump holes at drilling wells and refineries. Speedaire helped solve that problem. Photo courtesy of Associated Oil Co. of California.

SPEEDAIRE on sump truck saves $315

POWER is transmitted from the engine to the vacuum pump of this oilfield sump truck by a Speedaire unit. For this special job, a fan-cooled speed reducer is ideal. It affords a 3-way saving: it saves 650 pounds, or 54% of the weight; saves 6.1 cubic feet, or 61% of the space occupied; saves $315, or 34% of the initial cost of a conventional worm-gear drive.

Speedaire is Cleveland's fan-cooled worm-gear speed reducer. Because it is fan-cooled, Speedaire does more work—delivers up to *double the horsepower* of standard worm units of equal frame size, at usual motor speeds. It can be installed economically on many applications where other types have been used heretofore—giving you the advantage of a compact right-angle drive. Speedaire gives the same long, trouble-free service characteristic of all Clevelands.

For full description, send for Catalog 300. The Cleveland Worm & Gear Co., 3286 E. 80th St., Cleveland 4, O.

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CLEVELAND
Worm Gear
Speed Reducers

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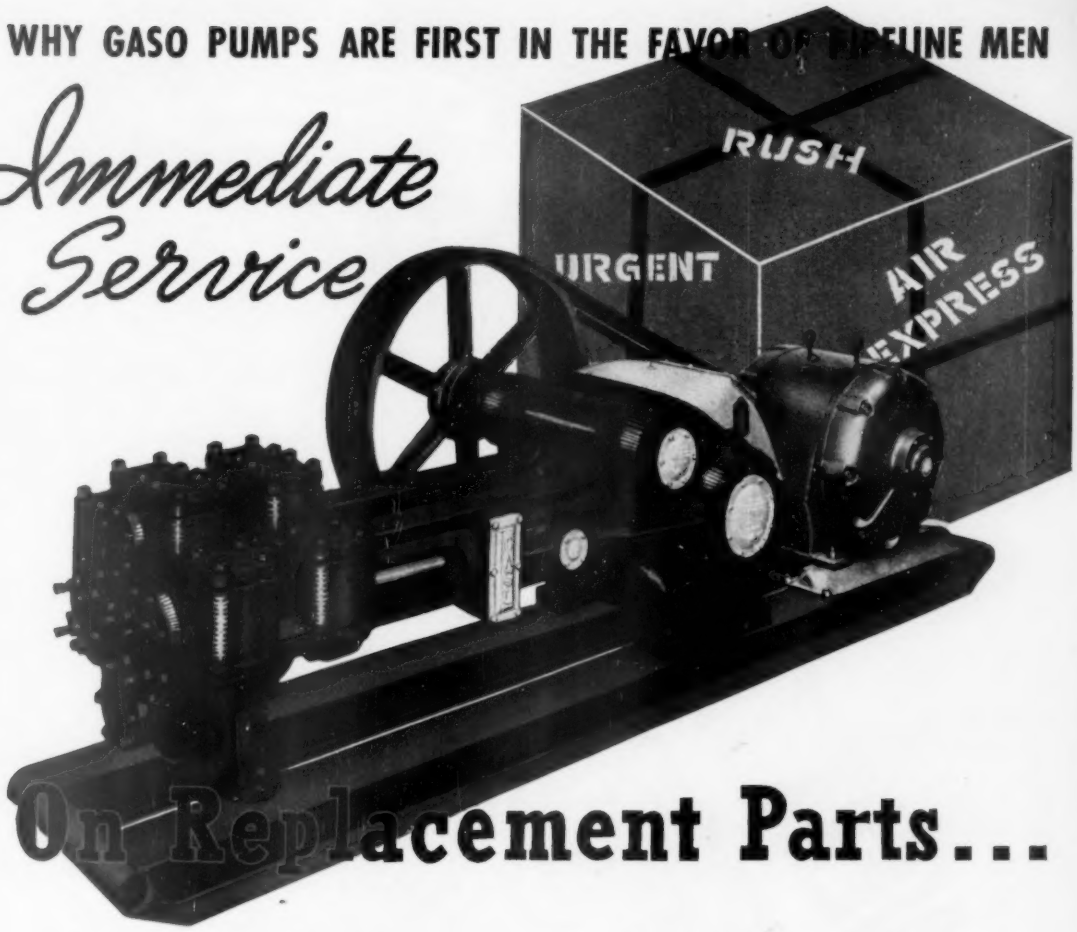

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Let's face it—even Gaso Pumps may sometimes need a replacement part, especially when they have been operating long after the retirement age of ordinary pumps. But when it happens, Gaso users don't worry. They know that Gaso maintains stocks of parts for all standard models regardless of age, with a policy of immediate shipment by fastest possible route. May we send you a copy of our latest catalog?

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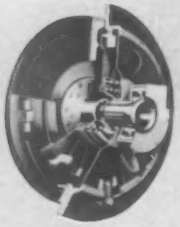
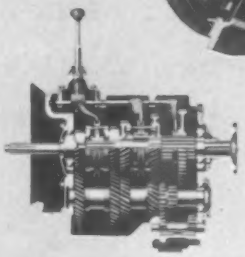
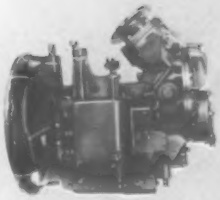
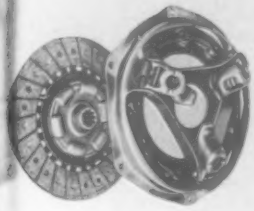
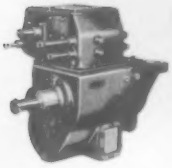






meet marion and fort wayne no. 2





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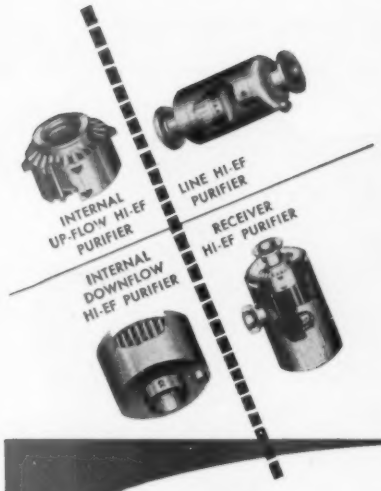

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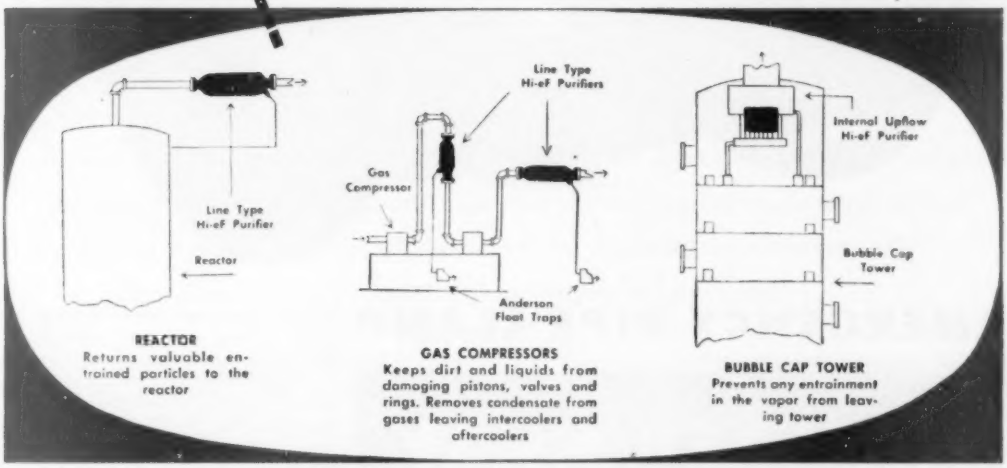
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GAS COMPRESSORS
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BUBBLE CAP TOWER
Prevents any entrainment in the vapor from leaving tower

● Every petroleum engineer and production man knows that steam, vapors, compressed air and gases pick up entrained moisture and solids as they pass through pipelines. This entrainment may be in the form of line scale, rust and condensate that damage equipment . . . or valuable liquids arising with the vapor in bubble cap towers, vacuum towers, stripping columns, reactors and the like.

But whatever the case may be, the big problem is how to effectively intercept these entrained particles. At last there is a *new, easy, economical* way to remove dirt and moisture from all kinds of vapor and gas processes. Low-cost Anderson Hi-eF Purifiers embody a new design employing multi-stage separation guaranteed to remove or recover 99% of all entrainment! And it does the job without the use of filters, baffles or moving parts—and separation is accomplished with a minimum of pressure drop.

Save money for your plant. Use Hi-eF Purifiers to protect gas compressors . . . to knock down particles and recover valuable liquids in bubble cap towers, reactors and scores of other applications. Try one on your most troublesome entrainment problem. Anderson guarantees satisfactory results.

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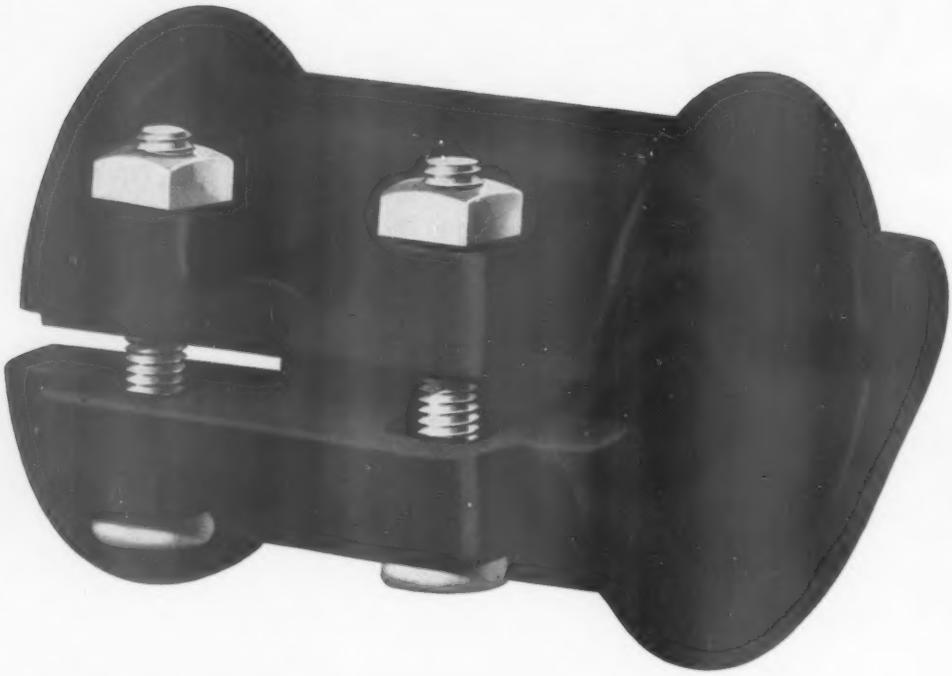

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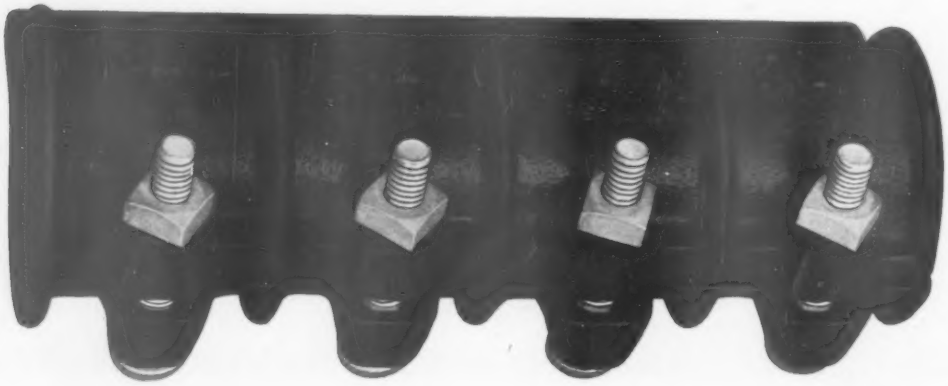

RAYMOND SERVES SEARS ROEBUCK

Architect: Stiles O. Clements.
Contractor: L. E. Dixon Co.

Architect: The Ballinger Co.
Contractor: Wise Contracting Co., Inc.

Architect: Stiles O. Clements.
Contractor: L. E. Dixon Co.

Sears Roebuck & Company continues to turn to Raymond for their foundation work . . . Sixteen different Sears stores (seven shown here) in ten States rest on Raymond piles . . . These repeat performances are further evidence that leading industrial organizations consistently utilize Raymond services for their important projects.

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Architects: Shutze & Armistead. Engineer: Robert G. Lose. Contractor: A. Artley Co.

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Architects: Shutze & Armistead.
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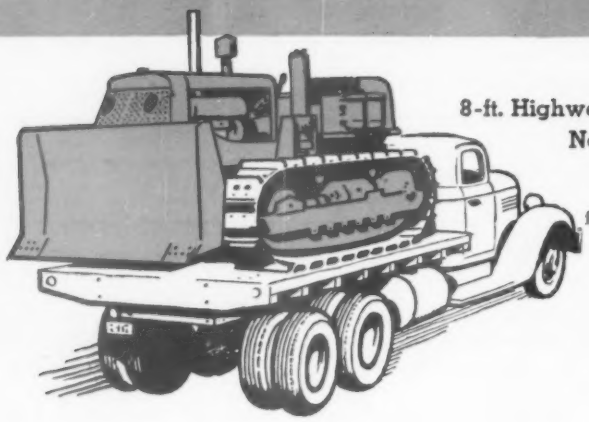
HERE'S *New Speed* IN SLUSH PIT DIGGING WITH ALLIS-CHALMERS HD-9 TRACTOR AND 9X NO PUSH-BEAM DOZER

This new Allis-Chalmers HD-9 Tractor, no push-beam dozer combination is a versatile performer for general oil field use—and a "yards ahead" dirt mover on slush pit digging. Follow this picture story and see how it's done—then get all the facts from your Allis-Chalmers dealer on this new lower cost dozer combination.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



8-ft. Highway Width Blade—
No Transport Permit Needed.

You can transport this outfit from job to job at a moment's notice —without a special permit.

- 72 Drawbar hp.
- Weight with dozer, 21,500 lb.
- 6 speeds forward, 3 reverse.

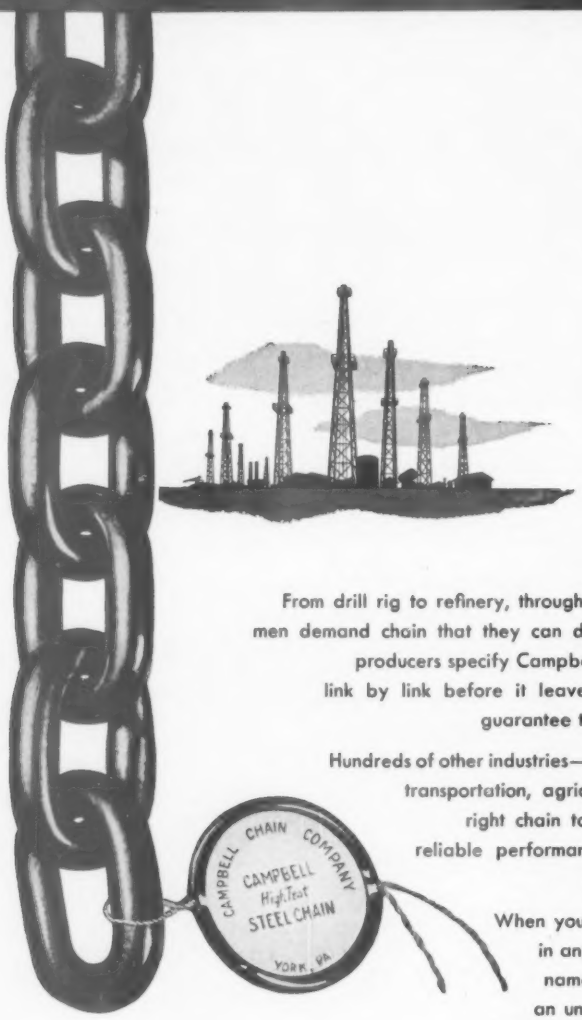
1. Starting the cut. Blade is mounted directly to HD-9 Tractor main frame. This provides a steeper penetration angle and with tractor-dozer lowered as a single unit there's real down pressure to bite into hard material. Because this new type mounting provides extra clearance, greatly increased track oscillation and better balance, this team is a phenomenal performer in mud and tough going.

2. Down she goes—fast. Note how steep blade angles reduce length of ramp — saves time, cuts waste of long approaches. For example, it gets down to a six-ft. depth with only an eight-ft. approach, eleven-ft. exit. And with no push beams blade is 1,150 lb. lighter than standard dozer. Costs less to buy, costs less to use.

3. Deep, narrow blade, powerful tractor hurries the job. With blade six inches higher than standard model, it handles a bigger vertical load. This, plus its narrow width, makes it ideal for digging the deep, narrow slush pit which drillers want. And the HD-9 Tractor with its powerful GM 2-cycle diesel engine and long, wide-tread tracks, provides the power and traction to ram out yardage in short order.

4. And here's your pit—finished in the shortest possible time. Just by pulling a single lever, operator can shift from any of the six forward speeds to any of the three reverses. And by using the high-speed reverse he can back up in a hurry—reduce waste time to a minimum. The combination of this HD-9 Tractor and the special 9X blade makes an unbeatable slush pit team.

Oil men never take chain for granted!



From drill rig to refinery, through production and transportation, oil men demand chain that they can depend on. That's why leading oil producers specify Campbell Chain . . . chain that is inspected link by link before it leaves the factory. This is Campbell's guarantee that the chain is safe and sure.

Hundreds of other industries—among them mining, manufacturing, transportation, agriculture—look to Campbell for the right chain to fit their specific needs. Years of reliable performance have proved the long-lasting dependability of Campbell Chain.

When you need chain, for any purpose . . . in any grade, be sure to order it by the name—Campbell. Or, when you have an unusual problem involving chain, call the Campbell representative in your area. Take advantage of his experience.

Chain for every need . . . INDUSTRIAL . . . MARINE . . . FARM . . . AUTOMOTIVE

CAMPBELL CHAIN *Company*

MAIN OFFICE—YORK, PA. • *Factories*—York, Pa., and West Burlington, Iowa

CAMPBELL CHAIN

MAKERS OF FAMOUS CAMPBELL LUG-REINFORCED TIRE CHAINS

LIGHTNING PRODUCES FERTILIZER, TOO

Nature's fireworks — by transforming the inert nitrogen in the air to nitric acid — produce much more fertilizer per year than do Chemico-built plants. But lightning scatters its benefits without consideration for those who need them. Chemico-built plants, on the other hand, produce the kind of commercial fertilizer you want . . . where you want it . . . when you want it . . . in the concentration you want . . . at a very reasonable price.

Chemico offers a complete engineering and contracting service to the fertilizer industry, ranging from the design and contruction of complete fertilizer works to furnishing small individual units and auxiliary plants of a specialized nature. From Pittsburgh to Pakistan, from Colombia to China, Chemico has been building such plants since 1914. Chemico brings to each new project a wealth of experience, proven methods and guaranteed performance.

If your plans include the production of nitrates, superphosphates, double superphosphates, ammonium phosphates, mixed salts or any other commercial fertilizers, it will pay you to discuss your specific problems with Chemico.

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

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TECHNICAL REPRESENTATIVES: CYANAMID PRODUCTS LTD., LONDON * CHEMICAL CONSTRUCTION (INTER-AMERICAN) LTD., TORONTO * SOUTH AFRICAN CYANAMID (PTY) LTD., JOHANNESBURG

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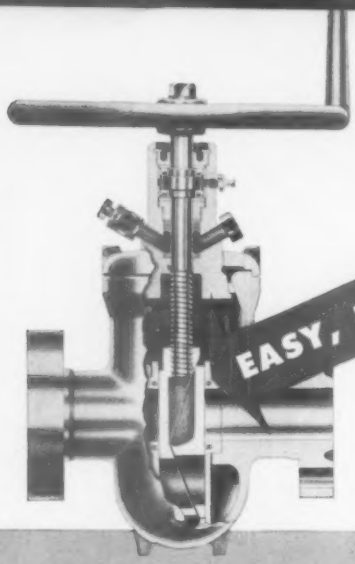
Chemico plants are profitable investments

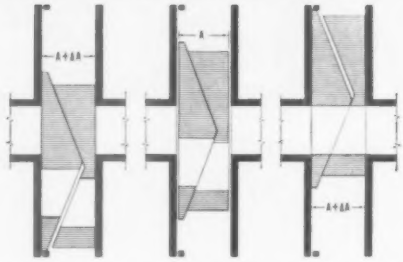


EASY, POSITIVE SHUT-OFF HERE..

MEANS SURE, SAFE CONTROL HERE!

W-K-M Parallel Expanding Gate provides a pressure-tight seal, open and closed — permits free-running operation under full-rated pressure.

Double-thrust Roller Bearings, ground stem threads, superfinished stem where it passes through the packing, contribute to the easy operation of W-K-M valves.



In closed position, the gate (left) and segment (right) seal tightly against both seats.

When opening or closing, the gate and segment are in neutral position, permitting free upward or downward movement of the gate assembly.

When open, the gate and segment again seal tightly against both seats and the bore of each lines up perfectly to provide a smooth, turbulence-free passage.

For the greatest safety, greatest operating reliability, oil men the world over specify W-K-M valves for their Christmas trees. The basic design of W-K-M valves (illustrated at left) provides a sure, tight seal in opened and closed positions and free-running operation while opening or closing.

Oil men specify W-K-M, too, because of its large and competent field organization qualified to render field emergency service and assist W-K-M valve users in any valve problem. W-K-M valves may be serviced and even completely overhauled without removing them from the Christmas tree.

Specify W-K-M for the surest and safest well control — for W-K-M valves are by far the most economical in the long run. 80% of the world's high pressure wells are controlled by W-K-M valves.

All W-K-M Valves Have

Through-Conduit Fluid Passage • Parallel Expanding Gate Assembly • Oversize Replaceable Seats Pressure Seal Bonnet • Double Row Thrust Bearings on Stem • Internal Lubrication

W-K-M COMPANY

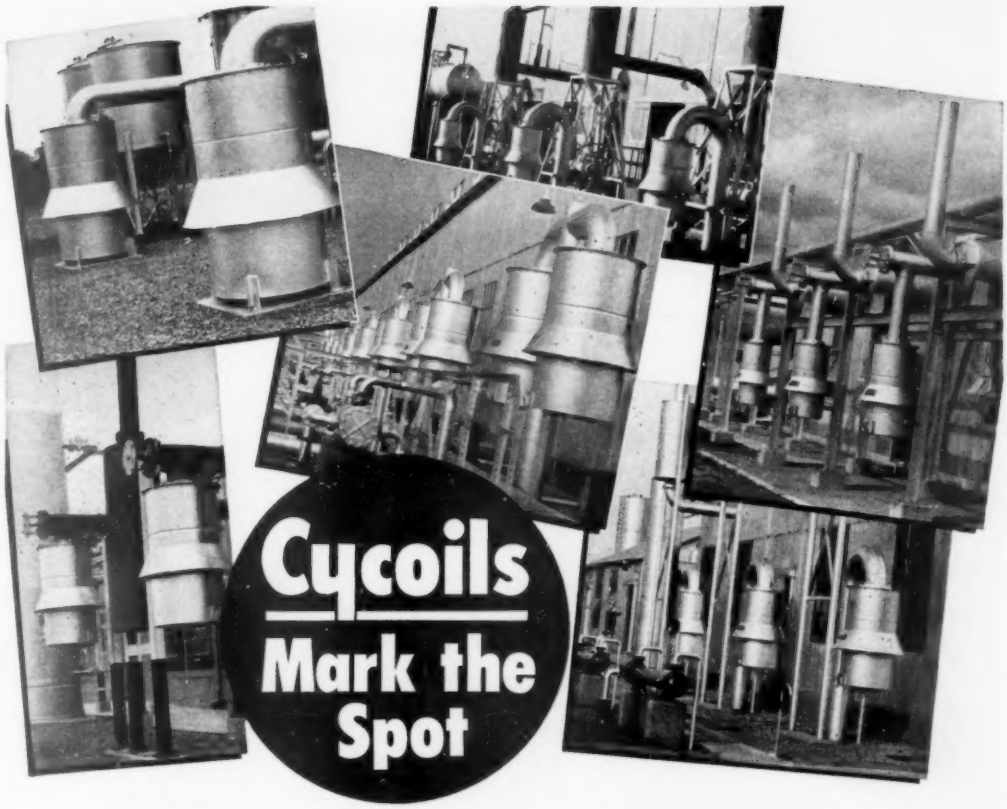
P. O. BOX 2117 HOUSTON 1, TEXAS

727 W. SEVENTH STREET, LOS ANGELES, CALIF.

EXPORT OFFICE: 30 Rockefeller Plaza, New York, N. Y.

W-K-M *Valves*

OILFIELD • PIPE LINE • PROCESS VALVES



Where Engines and Compressors Enjoy Complete Dust Protection

Such spots are numbered by the hundreds. Nor are all of them confined to the "dust bowl" areas of the nation. Find a cost-minded management that recognizes how dust damage contributes to engine down-time and repairs and you'll find dependable Cycoil Oil Bath Air Cleaners on the job.

What's the secret of Cycoil's industry-wide acceptance? They're designed to fight for every particle of dust. Thorough mixing of oil with the intake air at the start results in over 90% of the dust content being trapped before it even reaches the Cycoil's filter pads. Then comes the final cleaning action of the filter pads for removal of the remaining 10%. Net result—approximately 100% clean air.

Why not get a firsthand report from the folks who really keep a running score on Cycoil performance? Write us today for list of representative users and complete Cycoil data.

AAF **American Air Filter**
COMPANY, INC.

444 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

TOLEDO

THREADERS and POWER DRIVES

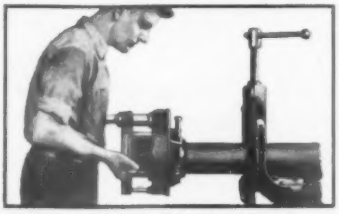
Gear Up Production!

Sure enough—the street scene at right is really Broadway, N. Y.—where the mechanic is operating a Toledo Power Drive and No. 2 Geared Threader. This job of installing new 3″ red brass for water service from the city main was handled by Water and Sewer Service Co.

Time was important on this job—as a trench was dug in the street and traffic had to detour. *Time was saved* by high-speed performance of the Toledo Power Drive operating Toledo geared tools! This also means *labor-saved* . . . and *money saved* for the contractor!

Wherever the job—in shop, plant or in the field—you can *speed up* pipe fitting and *reduce costs* with Toledo Tools! Precision-built . . . dependable. Order through your supply house. Write for catalog. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

Toledo Power Drive operating a Toledo No. 2 Geared Threader on 3″ red brass for water service at 217 Broadway, New York.



No. 2 geared adjustable threader, 2 ½″ to 4″ pipe, incl. *Lighter weight* than any other tool of this capacity!

No. 2BR Geared Adjustable Threader, 2 ½″ to 4″ pipe, incl. New Type 3-jaw pipe holder.

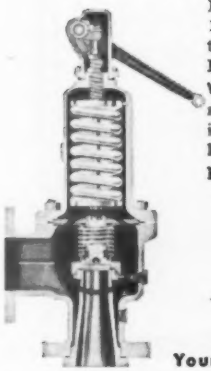
RELY ON THE 50 YEAR LEADER

TOLEDO

PIPE TOOLS . . . POWER DRIVES

. . . POWER PIPE MACHINES

Stuck without WARNING



Who's stuck? Safety valves that weren't safe? The plant which installed them?

None of this was necessary. If you want 100% safety—and you'd hardly want less—there's one sure way to get it—specify BalanSeal or FarriSeal Valves.

Why? Because they *can't* stick, plug or corrode. Critical working parts are permanently isolated from any contact whatever with the lading.

Because they're unaffected by back pressures in the discharge manifold due to its own operation or to the opening of other valves in the line.

Because these features make it possible for you to use smaller discharge piping, an economy which is often substantially more than the valve cost.

You'll be interested in the engineering of BalanSeal and FarriSeal Valves—design which is rapidly gaining acceptance in hundreds of successful installations.

Ask for our "8-Minute Brief."

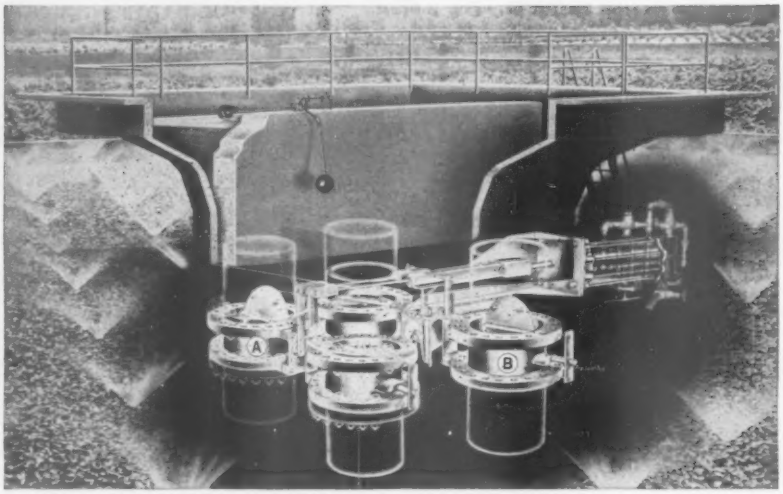
Farris ENGINEERING CORP.

412 COMMERCIAL AVE., PALISADES PARK, N. J.

Your Safety's REAL With FarriSeal...

R-S valvEvents

• EXCERPTS FROM THE R-S BOOK OF EXPERIENCE •



R-S Simplified Sewage Control System

This dosing pit control system is located in the Ontario-Upland, California, sewage treatment plant. In continuous operation day and night for over two and one-half years, it shows the tandem cycling of the valves which occurs every four minutes.

The system consists of four twenty-four inch heavy duty R-S Valves operated by a single water cylinder through cross linkage. While the far pit is filling through valve (A), the near pit is draining through valve (B) and discharging through the spray nozzles. As soon as the far pit is full, the float control will actuate the water cylinder by means of air operated three way valves, thus draining the pit and filling the near pit at the same time. Handwheel operation is provided for emergency use.

Rugged construction with minimum friction means long life and trouble-free operation for R-S Valves.

Consult your local R-S Valve Engineers, or write direct.

R-S PRODUCTS CORPORATION • 4600 Germantown Ave., Philadelphia 44, Pa.

An S. Morgan Smith Company Subsidiary

DISTRICT OFFICES IN PRINCIPAL CITIES

If you make hollow parts, we'll give you the hole

THE center hole's already in Timken® seamless steel tubing. There's less time wasted on machining; you get more parts from each ton of steel you buy because there's less scrap.

Often, finish boring's the first step—screw machine stations can be used for other operations. You get greater machine capacity without adding machines.

Higher quality in your product is assured because the piercing process by which Timken steel tubing is made is essentially a forging operation. The tubing has a uniform spiral grain flow for greater strength and a refined grain structure which brings out the best in the quality of the metal.

And to help you save even *more* steel, the Timken Company's tube engineering service will study your problem and recommend the most economical tube size for your job guaranteed to clean up to your finished dimensions.

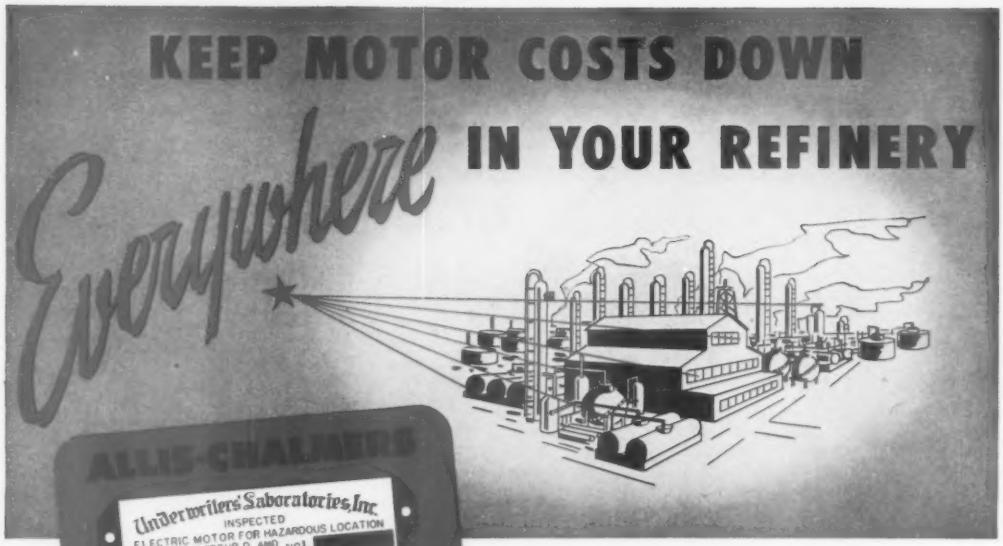
For further information on the uses of Timken seamless steel tubing, write The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

KEEP MOTOR COSTS DOWN

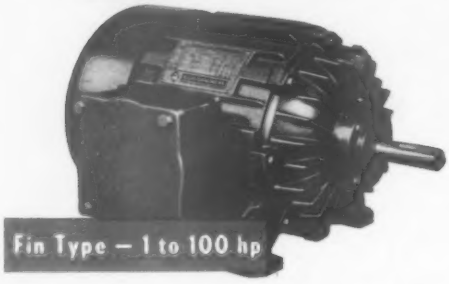
Everywhere IN YOUR REFINERY



1 to 3000 hp FOR EVERY REFINERY NEED

. . . practically self-cleaning

. . . built for outdoor installation



Fin Type — 1 to 100 hp

Tube Type — 60 to 3000 hp

MAINTENANCE COSTS go way down when you use Allis-Chalmers fin-type explosion-proof motors. The entire heat radiating surface is exposed. There are no enclosed air passages to collect dirt and moisture . . . to clog and cause overheating. If cleaning should be required, it can be done quickly and easily with a cloth, air hose or vacuum cleaner.

Bearings in Allis-Chalmers Type APZZ explosion-proof motors are lubricated at the factory and should need no attention for years. However, if relubrication is desirable, it can be done without removing the motor from service. In addition to close fitting seals at the outer ends of the shaft, the bearings are protected from dust and dirt by a large reservoir of grease on the outer side of the bearing.

THE COOLING SYSTEM on Allis-Chalmers tube-type explosion-proof motors is practically self-cleaning. The system consists of a group of longitudinal tubes surrounding the stator. Warm internal air circulates around them while cool outside air is blown through them. Since the tubes are straight and smooth, the cooling air keeps them clean. If dirt should stick, it can easily be removed with a long-handled brush. Tubes may be made of a variety of materials as required by atmospheric conditions.

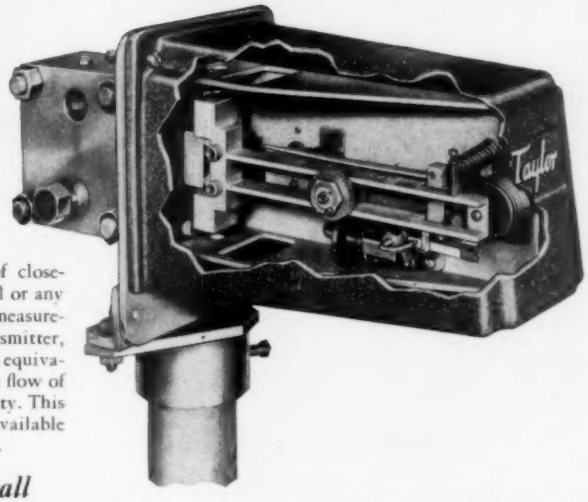
Bearings in Allis-Chalmers tube-type motors may be either grease lubricated, ball type, or sleeve bearings, depending on the size and speed of the motor. Both types have highly effective seals against dirt and dust, which makes this motor especially well suited for outdoor installation. A-3865

YOU CAN GET COMPLETE DETAILS on all Allis-Chalmers explosion-proof motors from 1 to 3000 hp with Underwriter's Labels up to 800 hp at 3600 rpm from Bulletins 51B7149 and 51B7286. To get your copies, call your nearby Allis-Chalmers Authorized Distributor or District Office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

Taylor announces SIMPLIFIED FLOW MEASUREMENT

—with the NEW Taylor TRANSAIRE® Differential Pressure Transmitter!



HERE'S Taylor's answer to the problem of close-coupled fluid flow measurement, liquid level or any other installation requiring differential pressure measurement and transmission. It is a force-balance transmitter, designed to convert differential pressure into an equivalent 3 to 15 psi output. It can be used to measure flow of liquid, steam or gas; liquid level or specific gravity. This Transmitter has a 1500 psi pressure rating and is available in any desired range, from 20" to 800" of water.

Inexpensive and Simple to Install

1. Simplified piping because it can be close-coupled to orifice flanges.
2. No Leveling—mercuryless dry meter.
3. Side, top or bottom bracket mounting available with 2" pipe stand.
4. No seal pots required—Negligible displacement because of force-balance construction.
5. Light weight for easy handling; weighs only 23 lbs.
6. Vent screws for simple, solid filling.

Enonomical—Easy to Maintain

7. Self draining or venting—no periodic manual venting or draining.
8. Mercuryless—flexible but tough Teflon coated glass fabric diaphragm.
9. Over-range to full body rating with no permanent damage.
10. Purges, if required, can be installed to keep body swept clean.
11. Simple range change by sliding pivot—screw driver trim.

Accurate

12. Relay valve for linearity, minimum hysteresis, fast speed of response.
13. Pressure effect 0.2% / 100 psi.
14. Temperature effect 1.0% / 100°F.
15. Self draining and venting. No errors build up during operation.
16. Damped pneumatic circuit—stable air output even on vibrating pipe lines.

Rugged and Dependable

17. Body forged steel or type 430 Stainless Steel. Working pressure rating, 1500 psi.
18. Weather-proof housing built for tough service and outdoor mounting.
19. Force-balance construction—negligible motion—minimum possible wear.
20. Process sealing bellows 3-ply type 316 stainless steel.

Adaptable

21. 100% suppression—continuously adjustable from 0 to 100%. Ideal for liquid level applications.
22. Ten-to-one rangeability in each of 2 forms: a. 20-200" water, b. 80-800" water.

Find out more about this latest addition to Taylor's three-part TRANSET* System. Ask your Taylor Field Engineer, or write for **Bulletin No. 98226.** Taylor Instrument Companies, Rochester, N.Y., and Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

TAYLOR INSTRUMENTS MEAN ACCURACY FIRST

these steam traps won't freeze up!

Freeze-ups of outdoor steam traps in winter weather often cause production delays. Don't take that chance . . . especially when it's so easy to install Yarways, the steam traps that *won't freeze up.*

They won't freeze because condensate does not accumulate. The only moving part—a little valve—is continually testing for condensate, discharging it as soon as it forms. There's never anything to freeze.

Other reasons why over 850,000 Yarway Impulse Steam Traps have been sold—they get equipment hotter, sooner; light weight; small size; easy to install and maintain; good for all pressures; made of stainless steel.

More than 200 industrial distributors sell Yarway Traps and Strainers. See your nearest one today. For name, and free 24-page Steam Trap Book, write . . .

YARNALL-WARING COMPANY
136 Mermaid Avenue, Philadelphia 18, Pa.

YARWAY

the steam trap designed with more production in mind

in WIRE ROPE, too, extra strength demands the RIGHT KIND of muscle

Towering as high as eight feet on his hind legs, the Kodiak or Alaskan Brown Bear ranks as the most powerful animal of North America. Rugged muscle development makes him the feared and deadly fighter that he is.

In wire rope, too, the right kind of muscle is essential to ward off the destructive effects of abrasion, corrosion, bending fatigue, load strain and shock stress.

That's why in Wickwire Rope we make sure—through complete quality control—that you always get the right construction and lay of the rope... the right grade of steel and size of wire for long-lasting resistance to the rigors of your particular service.

See your Wickwire Rope distributor or contact our nearest sales office.

THE COLORADO FUEL AND IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
THE CALIFORNIA WIRE CLOTH CORPORATION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New York • Philadelphia

WICKWIRE ROPE
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A YELLOW TRIANGLE ON THE REEL IDENTIFIES WICKWIRE ROPE

WICKWIRE ROPE

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PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

C. H. Broussard, Vice President of Independent, started out as a helper for IX 15½ years ago after attending LSU and Georgia Tech. He has progressed through every job in the exploration field including computer, party chief, review department head, and chief geophysicist. He has a total of 17 years experience in geophysical work.

Experience, Equipment and Modern Techniques are the keys to your Exploration Success

Independent Exploration Company has contributed generously to the development of new equipment and modern techniques during the 20 years in which it has served the oil industry.

Now one of the oldest and most experienced exploration contractors in the business, Independent believes that experienced Party Chiefs hold a key to your exploration success. Independent's crews under the supervision of Party Chiefs with an average of 16 years service, have served more than 100 important oil producers.

POINTING THE WAY FOR THE DRILL

IXC

Independent's Experience Merits Your Confidence

Independent *Geophysical Surveys*

EXPLORATION COMPANY

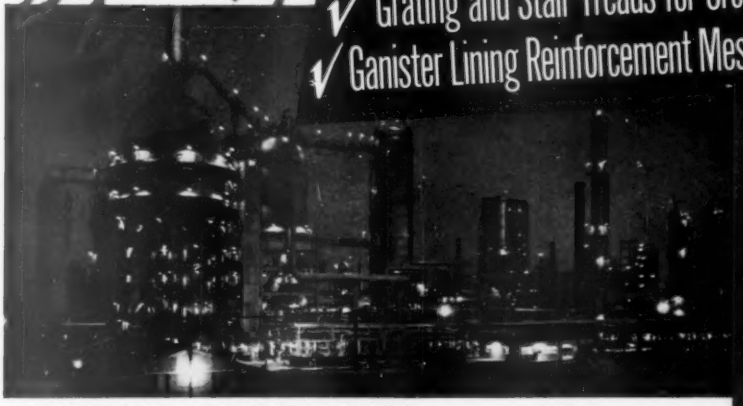
1973 WEST GRAY ★ HOUSTON, TEXAS

ESTABLISHED 1932

Specify KLEMP

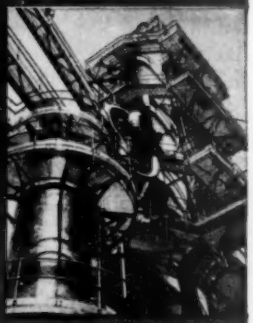
✓ Grating and Stair Treads for Greater Safety

✓ Ganister Lining Reinforcement Meshes for Longer Life



(Above) Thousands of square feet of KLEMP HEXTEEL installed in World's Biggest Catalytic Cracker Unit at this Giant Gulf Oil Refinery in Port Arthur, Texas.

(Below) DIAMOND RIVETED GRATING serves for strong, clean, non-slip, fireproof, ventilated catwalks, mezzanines, stairways and platforms, prefabricated to your most exacting specification. Shown here is a Shell Oil Company installation.



(Above) GANISTER LINING REINFORCED with KLEMP HEXTEEL, shown being welded into a cat cracker, keeps CATALYST REGENERATORS ON LINE Longer. HEXTEEL, when applied, as a reinforcement mesh is filled with a cement filler. This reduces "burn-arounds" to a minimum and helps avoid scouring and abrasive actions of the catalyst which can quickly ruin cat crackers and thermal crackers.

We Tread the World with Safety

The Klemp Metal Grating Corporation has been serving the needs of the Oil Companies for almost Half A Century. During this time Klemp has produced and patented several specialized gratings, such as HEXTEEL® and FLOORSTEEL® reinforcement meshes for use in fractionating vessels for the Oil, Chemical and Petro-Chemical industries.

KLEMP DIAMOND RIVETED and KLEMP KREST WELDED GRATINGS are consistently specified for stair treads, walkways, landings, tower stairs, catwalks, stairways and many other applications.

We are the only grating company to do all of our own work and we have complete fabricating facilities from complicated radial "set-ups", down to simple runs. Our engineers have spent a lifetime in this business and their specialized experience is at your service. We solicit the opportunity to solve your most difficult grating problems.

(Below) NEW KLEMP KREST* WELDED GRATINGS are made from special steel bars so formed to provide a peak or krest on the top side of the bar which gives this type of grating maximum non-slip characteristics. Ideal for structural foot walks as well as all other universal uses.

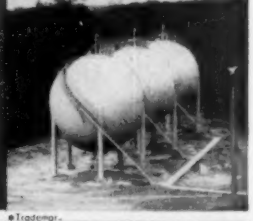
(Above) KLEMP FLOORSTEEL, because of its greater flexibility, is used to line the pipes leading to and from the catalyst regenerator. FLOORSTEEL is ideal for silencer stack units and also protects the narrow throat of the catalyst regenerator.

Write for Klemp's two new, free, fully illustrated technical catalogs, titled—

KLEMP 4 "Grates" serving the Nation's Major Oil Companies

KLEMP Open Steel Grating And Stair Treads

(Below) Klemp Manufactures Diamond Riveted, Welded and Serrated Stair Treads. This Serrated Tread has been developed especially for installations where unusual precautions are necessary to avoid accidents resulting from grease, mud, snow, etc.



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KLEMP METAL GRATING CORPORATION

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somewhere in your building,
lurking like a cat....
fire is ready to pounce.
In flammable liquids,
electrical equipment, record
vaults. Your surest protection
is a Kidde Fully Automatic
CO_2 Fire Extinguishing System.

Kidde

...quick as a mouse, check the "Yellow Pages" for your KIDDE dealer

Walter Kidde & Company, Inc.,
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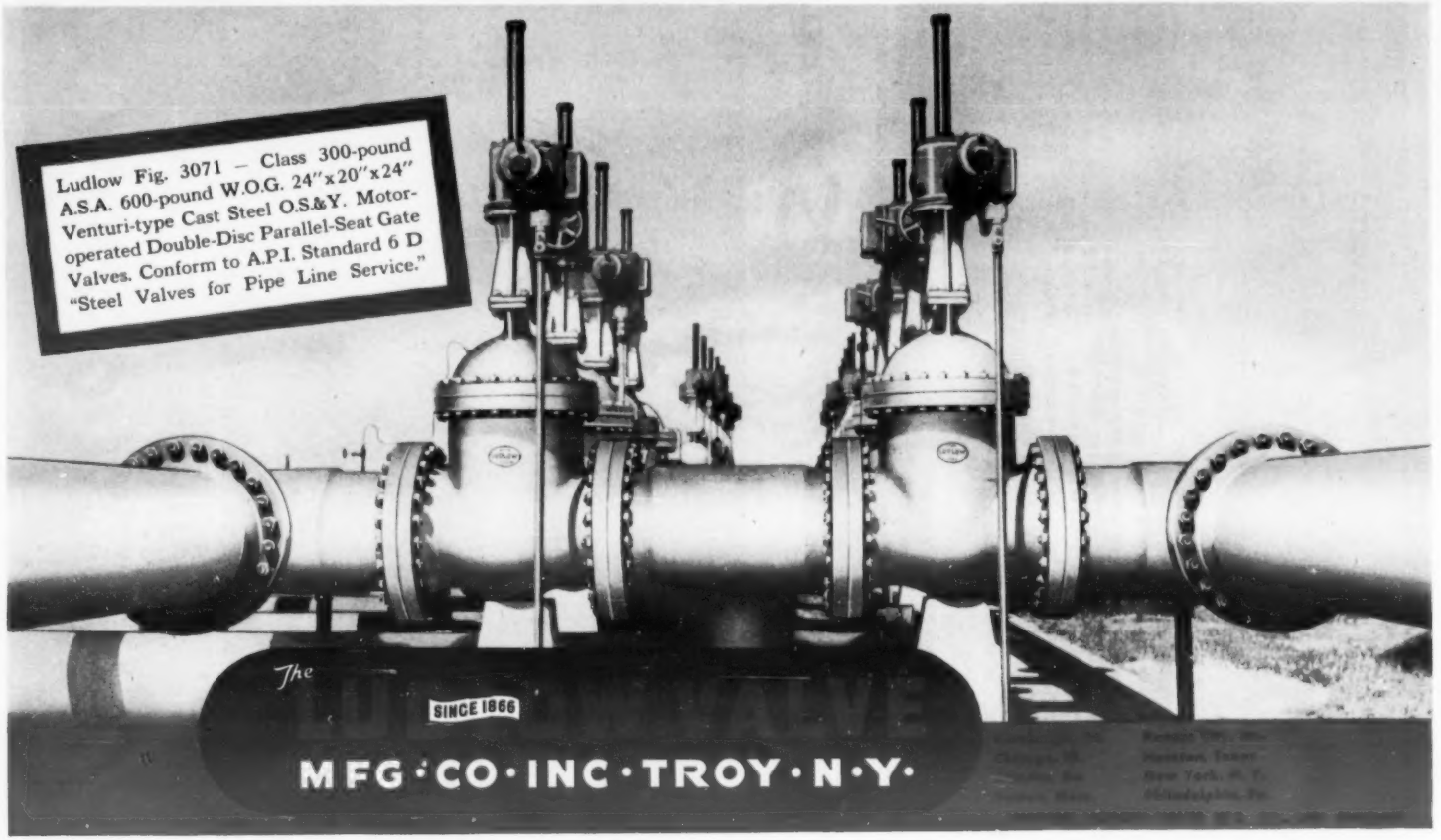
Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

LUDLOW

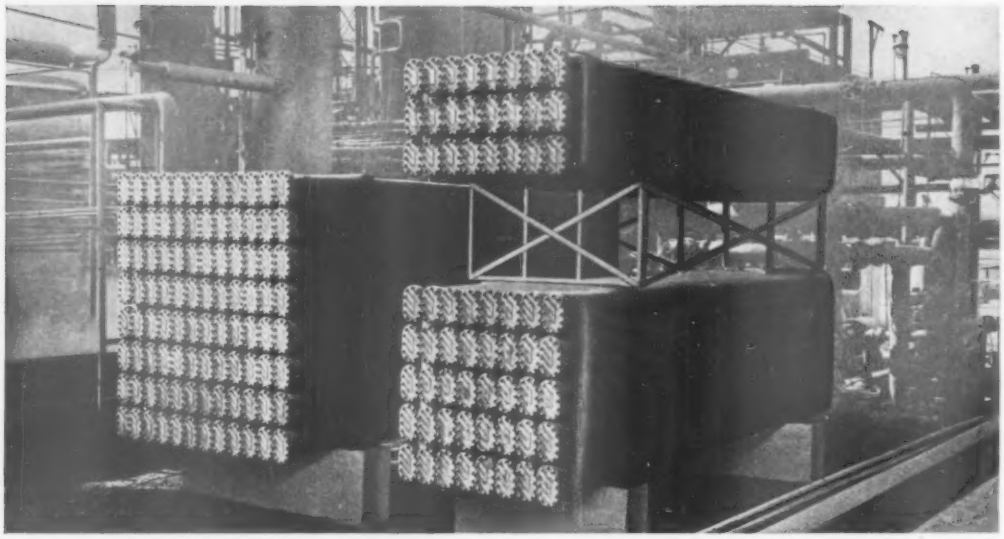
CAST STEEL OIL PIPELINE VALVES

Showing a typical installation of one of the major oil company's projects where 47 of these valves are used


Ludlow Fig. 3071 — Class 300-pound A.S.A. 600-pound W.O.G. 24"x20"x24" Venturi-type Cast Steel O.S.&Y. Motor-operated Double-Disc Parallel-Seat Gate Valves. Conform to A.P.I. Standard 6 D "Steel Valves for Pipe Line Service."
The
SINCE 1866
MFG·CO·INC·TROY·N·Y·

Six Reasons Why

you should specify



BROWN FINTUBE *Sectional* HEAT EXCHANGERS

FLEXIBILITY: If plant requirements change — and this is not uncommon — a "bank" of Brown Fintube heat exchanger sections can be disconnected and reassembled in different series-parallel arrangement easily and on short notice. "Bundle type" exchangers are not flexible. For them a change in duty usually involves designing — and waiting — for a whole new unit.

NO OBSOLESCENCE: Brown Fintube Sections never become obsolete. They can be used in one exchanger after another. Sections not in use serve as "standby" or parts, for other sections on stream.

REDUCED FOULING: Brown Fintube sections transfer more heat per lineal foot at lower surface temperatures. This minimizes coking. Also the longitudinal passages control the material flow eliminating eddies and reducing fouling.

EASY CLEANING: reduces maintenance costs. By manifolding just one extra parallel stream into an exchanger, the entire unit can be operated continuously — always clean — without ever coming off stream.

REDUCED STORES: Avoids tying up thousands of dollars in spare parts, housing and handling them.

PROMPT DELIVERY: Standardization permits economical assembly line manufacture from standardized parts — and prompt delivery.

If you heat — or cool — liquids or gases in your plant, you'll get a lot of ideas from our Bulletin No. 512. Send for a copy!

BROWN FINTUBE

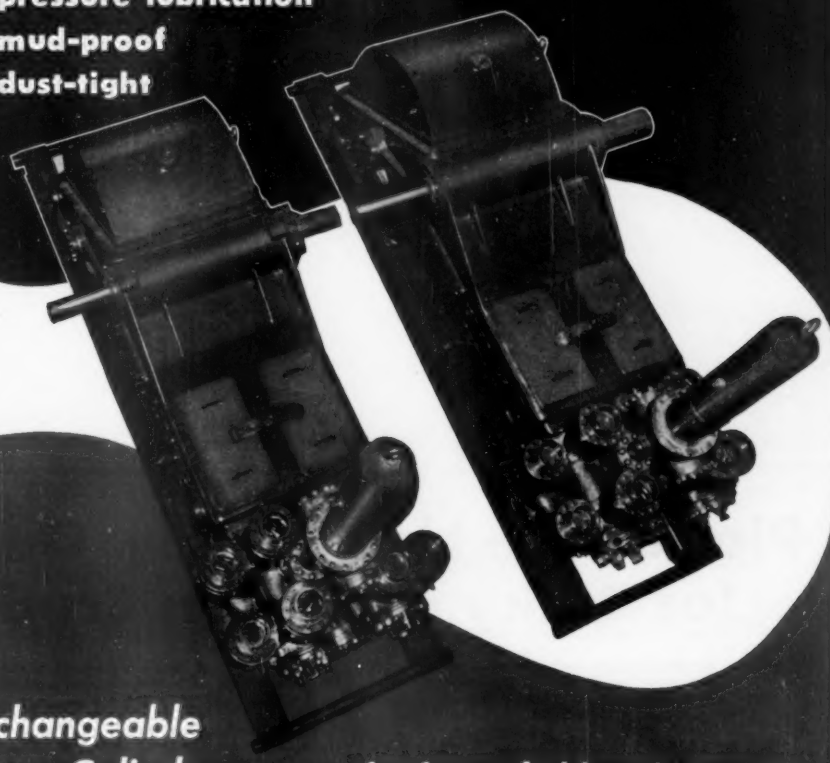
BROWN FINTUBE CO.
Elyria, Ohio

• Integral One-piece Fintubes; Sectional Heat Exchangers and Coolers; Vertical Heaters for Bulk Storage Tanks; Tank Suction Heaters; Pressure and Section Line Heaters; Process Tank Heaters; Fired Indirect Heaters and Special Types of Fintube Heaters and Coolers.

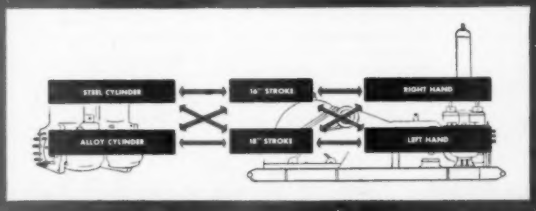
NEW YORK • BOSTON • PHILADELPHIA • PITTSBURGH • BUFFALO • CLEVELAND • CINCINNATI • DETROIT • CHICAGO • ST. PAUL • ST. LOUIS
MEMPHIS • BIRMINGHAM • NEW ORLEANS • SHREVEPORT • TULSA • HOUSTON • DALLAS • LOS ANGELES • SAN FRANCISCO • and ST. THOMAS, ONT.

For Your Peace of Mind...

. . pressure lubrication
. . mud-proof
. . dust-tight



Interchangeable Cylinders . . . for faster field maintenance



one steel or alloy fluid cylinder
— fits either right- or left-hand side
— of either 16" or 18" pump

GOOD REASONS FOR CHOOSING
GARDNER-DENVER
MUD PUMPS

Write for Bulletins FX-10 and F-70.

GARDNER-DENVER SINCE 1859

Gardner-Denver Company, Quincy, Illinois
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THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

Dallas • Houston • Tulsa • St. Louis
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2200 E. Slauson Ave.,
Los Angeles, Calif.

PIPE LINE PROGRESS

20-inch A. O. Smith line pipe being welded on the Rumsey Brothers, contractors, Nebraska spread of the Platte Pipe Line Company's 1,056-mile crude transmission line

Platte Pipe Line . . . New Outlet for Rocky Mountain Crude

A new 20-inch crude transmission main now delivers Rocky Mountain production to refineries at Wood River and Chicago, Ill., Bayshore (Toledo), Earhart (Detroit), Olean, N.Y., and Falling Rock, W. Va.

It is the 1,056-mile line of Platte Pipe Line Company, a Delaware corporation with stock owned by Sinclair Pipe Line Company, The Ohio Oil Company, Continental Oil Company, The Pure Oil Company and Toronto Pipe Line Company.

Big Horn, Wind River, Great Divide and Powder River basins of Wyoming and the Denver-Julesburg basin of Colorado and Nebraska supply the crude from existing producing wells, previously shut-in wells and recently drilled wells. By opening this Rocky Mountain area, new reserves and production from new drilling are now made available.

The pipe line begins in the Big Horn basin near Worland, Wyoming, and stretches in a southeastern direction across Nebraska, northeast Kansas and Missouri. Eastern terminal is Wood River, Illinois, from where other pipelines distribute the crude to refineries to the north and east.

A. O. Smith welded steel line pipe comprises more than half of this 20-inch main, a dominant factor in the completion of another great petroleum pipe line.

A. O. Smith Line Pipe is available in a complete range of sizes and wall thicknesses, from 8⅝-in. to 36-in. diameters.

FIRSTS by A. O. Smith: Welded line pipe • Internally expanded pipe • Light-wall large-diameter pipe • World's largest producer of large-diameter welded steel pipe.

The A. O. Smith Casing Mill is operating at capacity to supply vitally needed casing for the Oil and Gas Industry.

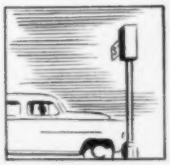
A.O.Smith

LINE PIPE • CASING

Chicago 4 • Dallas 2 • Denver 2 • Houston 2
Los Angeles 22 • Midland 5, Texas • New Orleans 12
New York 17 • Pittsburgh 19 • San Francisco 4
Seattle 1 • Tulsa 3 • Washington 6, D.C.
International Division: Milwaukee 1

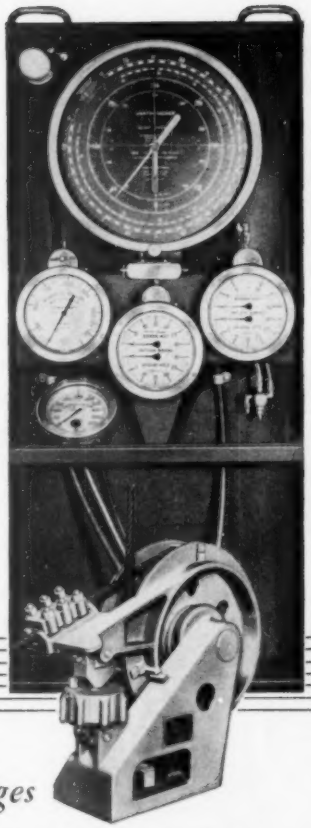
DEPENDABILITY THROUGH RESEARCH AND ENGINEERING

MARTIN-DECKER WEIGHT INDICATORS



are Hydraulic Operated . . . so are the brakes on your car!

Both Achieve Results Superior to those possible with Mechanical Actuation



The MARTIN-DECKER TYPE "D" WEIGHT INDICATOR and the IDEAL TYPE "D" WIRE LINE ANCHOR Provide the ultimate in Accurate—Sensitive Dependable—Rugged DRILLING CONTROL And WIRE LINE ANCHORING

Consider These Advantages

of the Martin-Decker Hydraulic Weight Indicator

- Greater Accuracy (No mechanism to wear out or get out of adjustment).
- More Flexibility.
- Weight Indicator can be located remotely from source of pressure.
- Weight Indicator can be located advantageously for the driller where he can read it.
- Adaptable to all types of rigs and conditions.

Martin-Decker Weight Indicators Are

SEALED

For Greater Accuracy and Service

No pumping up . . . No adjusting . . . No leaks. The Fluid System is factory loaded and permanently sealed. The fluid remains in the unit even during transportation and storage. Fast, foolproof installation—Guaranteed Accuracy.

Martin-Decker Hydraulic Weight Indicators are noted for their

SIMPLICITY • DEPENDABILITY • ACCURACY • SENSITIVITY • ADAPTABILITY • SMOOTH OPERATION • UTILITY AND FLEXIBILITY • LONGEVITY • Many Martin-Decker Weight Indicators are in use that are 20-25 years old.

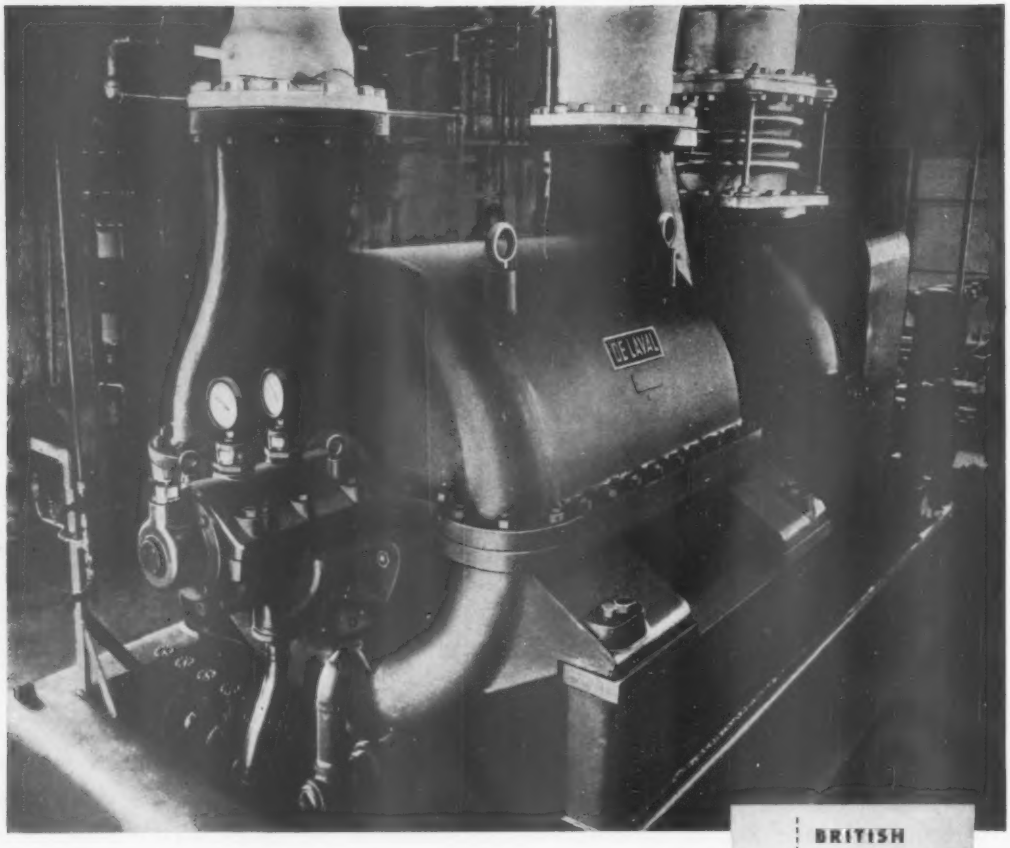
HOME OF THE WEIGHT INDICATOR

MARTIN DECKER CORP.

LONG BEACH, CALIFORNIA

SAN JOAQUIN VALLEY: T. J. CULLEN, BAKERSFIELD, CALIFORNIA
MID CONTINENT DISTRIBUTOR: REED ROLLER BIT COMPANY, HOUSTON, TEXAS
CANADIAN DISTRIBUTOR: REED ROLLER BIT COMPANY OF CANADA, LTD., CALGARY & EDMONTON, ALBERTA

MARTIN-DECKER WEIGHT INDICATORS AND IDEAL WIRE LINE ANCHORS ARE ALSO SOLD THROUGH THE NATIONAL SUPPLY EXPORT CORP., THE NATIONAL SUPPLY CO. AND OTHER RECOGNIZED SUPPLY HOUSES.



This blower never takes a "breather"

at BRITISH AMERICAN OIL COMPANY

The clock never stops on this De Laval catalytic cracking blower in the Edmonton, Alberta plant of the British American Oil Company. Twenty-four hours a day this 885 hp, 8,250 cfm unit handles air for the regeneration of the spent catalyst.

There are good reasons for this power-saving dependability. This heavy-duty machine is built to take punishment. Its rugged casings, husky, perfectly balanced rotor and externally mounted, cylindrically seated bearings are design features that reduce maintenance and insure long, continuous service. Remember, there's no divided responsibility—both turbine and blower are De Laval designed, and De Laval made.

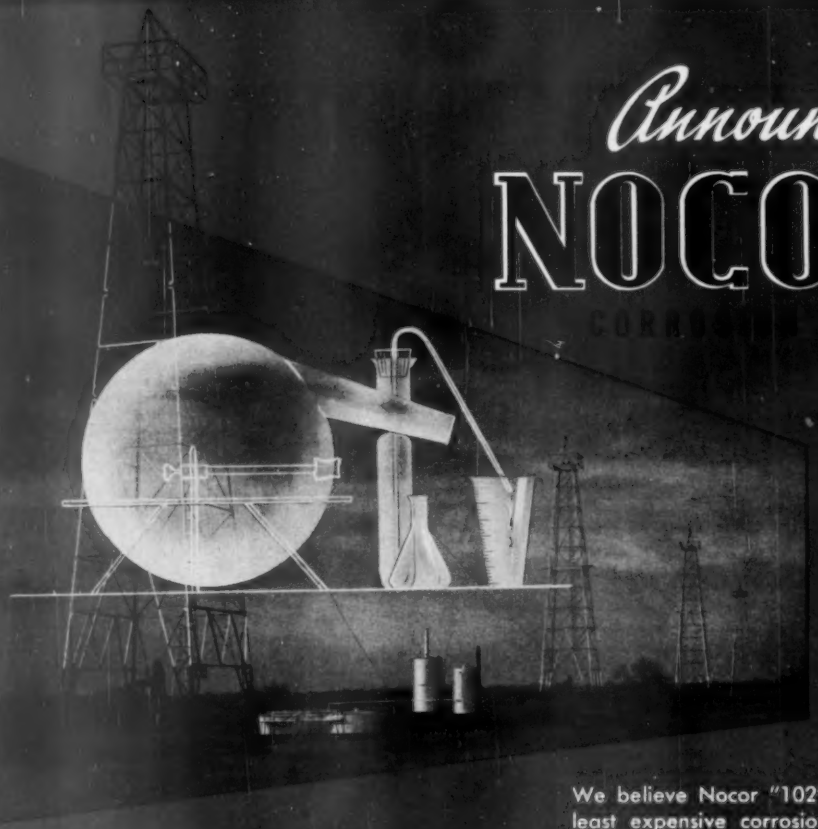
De Laval blower experience covers a wide range of industries—steel, refining, metal mining, chemical processing, high pressure gas transmission, manufactured gas, sewage aeration and many others. And all this engineering and manufacturing experience is ready to solve your specific blower application. Discuss it with a De Laval representative.

Send for Bulletin 0500 containing complete data

DE LAVAL *Centrifugal Blowers*

DE LAVAL STEAM TURBINE COMPANY
810 Nottingham Way, Trenton 2, New Jersey

DL 129



Announcing
NOCOR 102

FIELD TESTED

FIELD PROVEN

We believe Nocor "102" to be the most effective, least expensive corrosion inhibitor yet developed. Nocor "102" forms a more impervious, tighter film barrier, a chemical bond between product and steel . . . is soluble in all proportions in oil . . . treats many oil emulsions . . . is a new advance in "wettability" . . . controls dispersability to increase efficiency of the inhibitor . . . will not aggravate scale problems . . . is non-irritating, non-toxic . . . cannot contaminate finished products.

Nocor "102" is another result of Cardinal's unending research to make good things even better.

Detailed literature and samples upon request.

Complete Advisory Service

Crude oils, brines and production conditions vary widely from field-to-field. Corrosion inhibitors therefore cannot be expected to render identical performance without certain custom treatments to counteract individual conditions.

The manufacturers of Nocor "102" offer, without obligation, rate of corrosion test services, field service on initial application, and full consultation and advisory facilities.

Advisory service without obligation upon request.

Write for name and address of representative nearest you

CARDINAL CHEMICAL · INC.

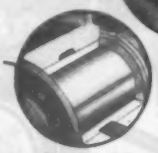
Odessa, Texas
Phone 6-4356

Hobbs, New Mexico
Phone 3-3116

Levelland, Texas
Phone 644

"SPOT CHECK"
of features of FARREL® SPEED INCREASERS

PRECISION GEARS — Precision generation by the famous Farrel-Sykes process results in extreme accuracy of tooth spacing, contour and helix angle. Highest grade materials contribute to long gear life.



OVERSIZE SLEEVE BEARINGS — With consequent low unit pressures. Precision finished to extremely close tolerances.

A "FOUNTAIN OF YOUTH" — The self-contained circulating oil system virtually puts power on "velvet" by providing a protective spray of oil at the mesh line of the gears and pressure lubricating the bearings.

PRECISION-GROUND SHAFTS — Extra large for the power to be transmitted. Give added stiffness against bending and torsional deflections under peak loading conditions.

These are the features which account for the amazing record of Farrel speed increasers in pipeline pumping service.

Although hundreds and hundreds of these units have been installed in pumping stations, not one has ever failed on the job. In fact, every unit placed in service since 1932, when the line was first developed, is still operating successfully.

For further details of these proved-on-the-job speed increasers, send for a copy of bulletin 448A. No cost or obligation.

EXCEPTIONALLY RIGID HOUSING — Holds rotating elements in original alignment, insuring maintenance of operating smoothness of precision - generated gearing.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Memphis, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, New Orleans

OIL FIELD REPRESENTATIVES:

Hercules-Lupfer Engine Sales Co., 124 N. Boston St., Tulsa 1, Okla.
V. W. Osborne, 860-A M&M Bldg., Houston 2, Texas

Farrel-Birmingham®

FB-773

YOUNG *All the Way!*

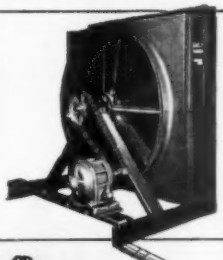
FROM WELL...

...TO GASOLINE PLANT

"MONO-WELD" Heavy-Duty Steel Radiator

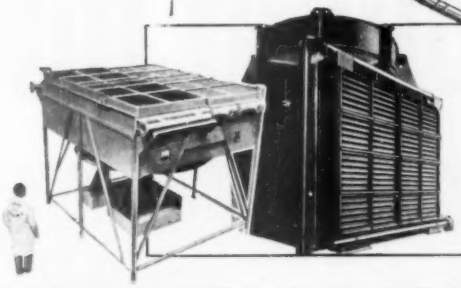
Fixed and Removable Tube and Bundle Heat Exchangers

"MONO-WELD" Radiators are available for cooling jacket water or for cooling jacket water and lube oil in a single unit. They are especially suitable for skid-mounted equipment and have welded steel tank and side member construction. Tube and bundle heat exchangers are particularly well adapted to applications where compactness is at a premium.



Heavy-Duty "FULL FLOW" and Standard Series Jacket Water Coolers

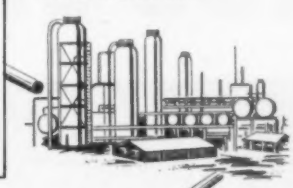
Remote locations require dependable, trouble-free cooling units, easy to maintain. Sturdily constructed "FULL FLOW" Jacket Water Coolers with removable sections (optional) make it possible to repair and replace easily. Accessories: motors, idlers, pumps, surge tanks, controls, shutters, etc.



Young "HC" (left) and "VAD" Vertical Air Discharge Cooling and Condensing Equipment

These large units can take care of your biggest cooling job. Versatility is a keynote —standard models provide for water, gas or oil cooling, steam or vapor condensing in any combination. Accessories available: motors, controls, shutters, gear boxes, etc.

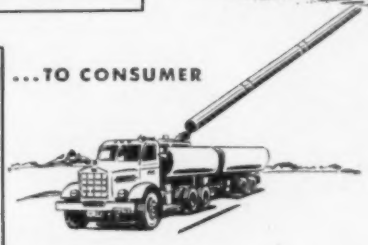
...TO REFINERY



Young Radiators For All Automotive Applications

Young serves every phase of the oil industry. Many manufacturers of oil transport and delivery equipment specify Young Radiators for gasoline and Diesel equipment. These radiators are carefully engineered for the specific job, as is the heat transfer equipment for the biggest oil field jobs.

...TO CONSUMER



YOUNG

HEAT TRANSFER PRODUCTS FOR AUTOMOTIVE AND INDUSTRIAL APPLICATIONS.

HEATING, COOLING, AND AIR CONDITIONING PRODUCTS FOR HOME AND INDUSTRY.

T.M. REG. U.S. PAT. OFF.

YOUNG RADIATOR COMPANY

Dept. 203-A • RACINE, WISCONSIN

Factories at Racine, Wisconsin, and Mattoon, Illinois

OIL FIELD REPRESENTATIVES:

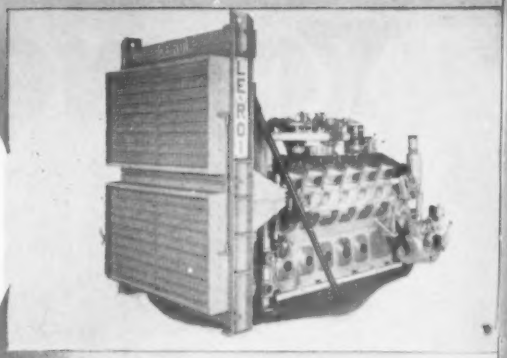
TULSA: J. R. Meek Company
1341 S. Boston St., Rm. 109

LOS ANGELES: Flournoy & Everett, Inc.
5043 Santa Fe Ave.

MUSKEGON: Harold J. Young
206 Montgomery Bldg.

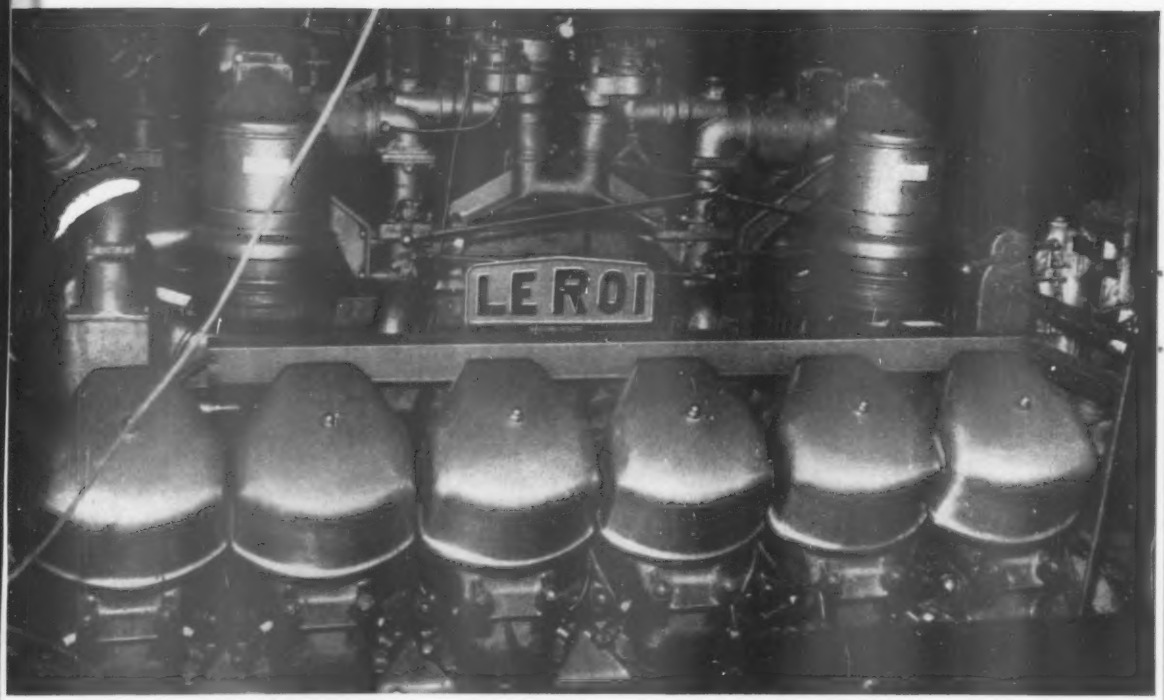
Other Representatives in Principal Cities

Le Roi 3-way partnership



1 Better Engines. Men from one of the southwest's largest drilling contractors call Le Roi's L3460 "the finest oil-field engine ever made!" 15 of their 19 rigs are powered by Le Roi L3460 or RX Series engines. That's typical of the oil field's endorsement of Le Roi's progressive design policies.

You come out of the



Jack Grace Drilling Co. uses 2 Le Roi L3460's to power their rig. In drilling to 9,100 feet, they use 5" drill pipe which makes hoisting load equivalent of 15,000 feet of 4½" pipe.

2 Better Applications. Exclusive Le Roi distributors and factory men are oil-field power specialists. They know engines. That's why they can select the right power unit for any application. That's why you can bank on Le Roi for dependable, low-cost power.

3 Better Service. Ample factory, branch office, and distributor parts stocks mean minimum downtime for repairs. Skilled service men are ready to go 24 hours a day. Keeping your Le Roi engines running is a recognized responsibility.

hole fast!

two Le Roi L3460's hoist 5" pipe from 8300 ft. on wet trip in just two hours!

This recent experience of Jack Grace Drilling Co., Wichita Falls, Texas, is just one demonstration of what the Le Roi L3460's extra power can do. Reports from all fields show that when you need power — fast! — you can count on your Le Roi L3460's.

They are conservatively rated — have plenty of reserve power to pull you out of the tight spots. And they respond to the throttle lightning-fast for hoisting service.

Here you have oil-field power at its best: A wide speed range from 600 to 1350 rpm. Horsepower from 350 to 600 max. Lugging power at slow speeds. Compactness that helps you keep over-all width and weight limitations. Dependability and economy under continuous loads. Like all Le Roi engines, the L3460 operates on the most economical fuels in the oil fields — natural gas and butane.

Ask your rig manufacturer, supply house, or Le Roi distributor to show you L3460 and other Le Roi engine installations — or write us. See for yourself why you're way ahead of the field, when you let Le Roi's 3-way partnership work for you.

LE ROI

LE ROI COMPANY

MILWAUKEE 14, WISCONSIN

Plants: Milwaukee • Cleveland • Greenwich, Ohio

Oil Field Headquarters: Tulsa, Oklahoma

See these Le Roi Distributors for a Profitable 3-way Partnership

Oklahoma
Le Roi Company Branch — Tulsa
Carson Machine & Supply Co.— Oklahoma City

East & South Texas, Gulf Coast
Southern Engine and Pump Company — Houston, Kilgore, Edinburg, Dallas, San Antonio, Corpus Christi, Texas, and Lafayette, Houma, Louisiana.

North & West Texas, New Mexico
General Machine & Supply Co. — Odessa, Snyder, Texas.
Nortex Engine & Equipment Co.—Wichita Falls, Texas.

Kansas
Carson Machine and Supply Co.—Great Bend

Illinois — Western Kentucky
Western Machinery & Engine Company — Centralia, Illinois and St. Louis, Missouri.

Michigan
Hofer Engine Service — Reed City

Rocky Mountain Area
Gehring Equipment Co. — Casper, Wyoming, Rangeley, Col.

Mississippi, Arkansas and Northern Louisiana
Ingersoll Corporation — Shreveport, Louisiana, Jackson, Mississippi, El Dorado, Arkansas

West Coast
Le Roi-Rix Machinery Co. — Los Angeles, Long Beach and Bakersfield, Calif.

Appalachian Area
P. C. McKenzie Co., Pittsburgh, Bradford.

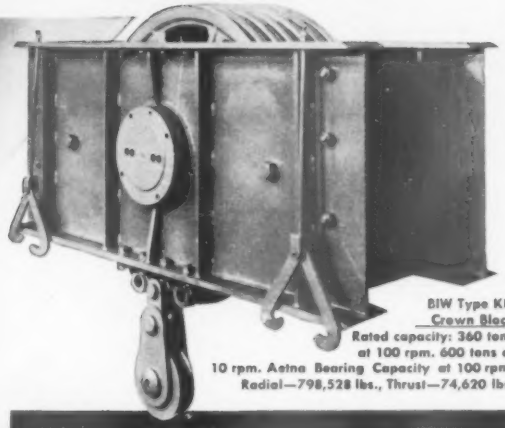
Canada
Lucey Export Ltd. — Calgary, Edmonton, Alberta.

P-114

A Typical Le Roi Service Facility

This service shop, equipped with the finest tools available for engine overhaul, belong to the Gehring Equipment Cc., Casper, Wyoming. Gehring provides prompt service to an area stretching from the southern boundary of Colorado to the Canadian border. They maintain the only complete engine parts stock in the Rocky Mountain area. Emergency cases are handled by plane. It is because of service like this that you can always depend on Le Roi.

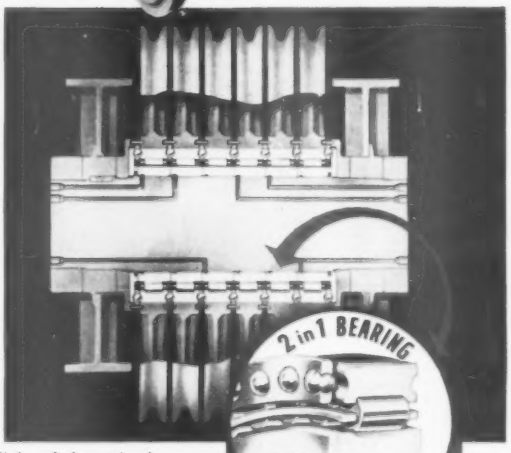
BIW Blocks
TEAMED WITH
Aetna
BEARINGS...



BIW Type KN Crown Block
Rated capacity: 360 tons at 100 rpm. 600 tons at 10 rpm. Aetna Bearing Capacity at 100 rpm. Radial—798,528 lbs., Thrust—74,620 lbs.

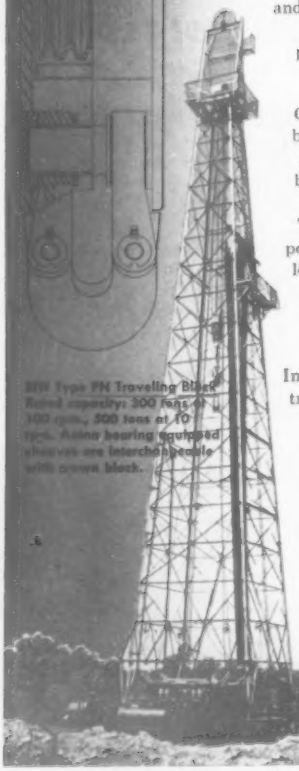
ANOTHER EXAMPLE OF HOW AETNA COOPERATIVE ENGINEERING PAYS OFF

Compact, streamlined, weight-saving design and vastly superior functional utility—both are achieved in these Beaumont Crown and traveling blocks as a direct result of the patented Aetna 2-way bearing illustrated.



Combining, as it does, both cylindrical rollers and balls, this unique bearing handles both radial and thrust loads as pure, right angle, non-interfering loads. This revolutionary design attains the lowest possible coefficient of friction, increases radial load capacity, lengthens bearing life, reduces risk of down-time, cuts block maintenance and bearing replacement costs to a new record low.

BIW Type FN Traveling Block
Rated capacity: 300 tons at 100 rpm., 500 tons at 10 rpm. Aetna bearing equipped sheaves are interchangeable with crown block.



In the development of these better crown and traveling blocks, the experience of Beaumont Iron Works Company has been typical of other manufacturers the country over. They've found it pays . . . handsomely . . . to work with Aetna. Very possibly, you too, can improve your product and save money—with the help of Aetna engineering teamwork. Why not try it and see . . . on a confidential, no-obligation basis? Aetna Ball and Roller Bearing Company, 4600 Schubert Ave., Chicago 39, Illinois.

This efficient, compact design reduces width and weight, yet increases strength and durability of crown and traveling blocks—is adaptable to blocks with any number of sheaves.

Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings

AMERICAN PLOW STEEL LINES

provide extra strength for this cable tool rig

● Two American Tiger Brand Wire Lines are used on this cable tool drilling rig owned by Triangle Drilling Co., of McCamey, Texas. The wells in this area are usually deep, and tension and shock loads on the lines, as well as abrasive action, are heavy.

American *Plow Steel* Lines were specified to provide the strength and resistance to abrasion required for economical drilling to these depths.

The drilling line of this rig is 9,000 ft. of ⅞", 6 x 19 Fiber Core construction; and the sand line is 9,000 ft. of 9/16", 6 x 7 Fiber Core construction.

American Lines are made in many sizes, 10 constructions, and 3 standard types of steel that satisfy every oil well line requirement. To make sure you get the right line for every job, consult the American Wire Line Specialist in your area—he can give you expert advice in the selection and use of your lines. Call or write the nearest American Steel & Wire District Sales Office for his help.

AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

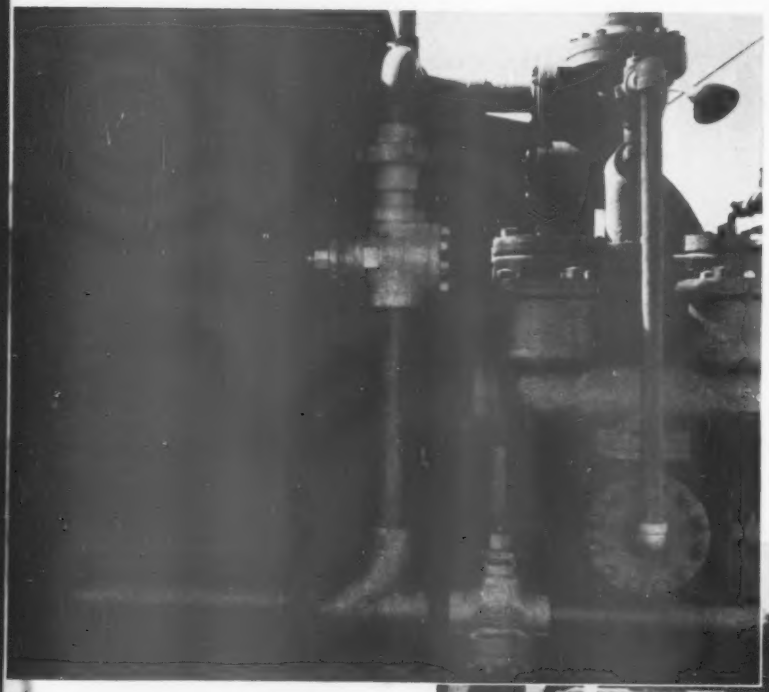
USS

U·S·S AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

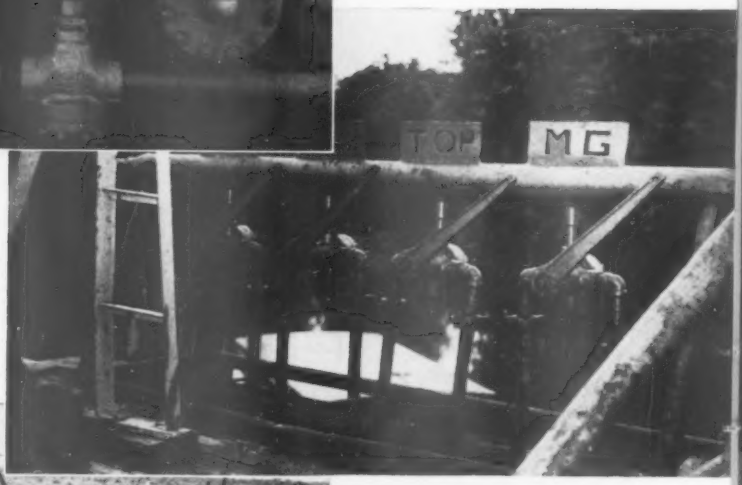
UNITED STATES STEEL

3 REASONS WHY



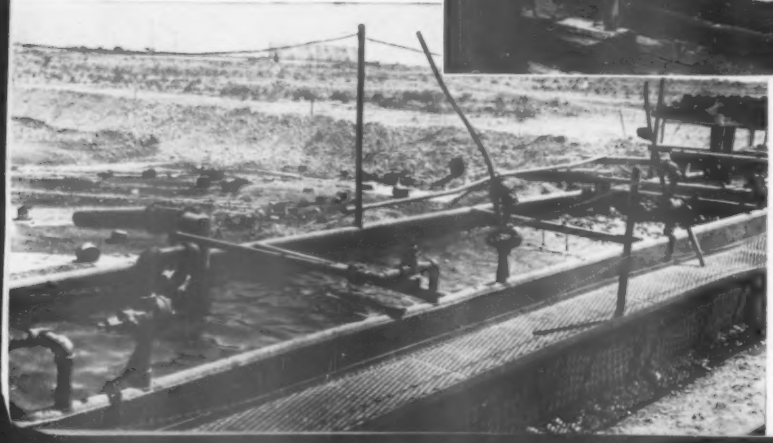
ARMOR-PLATED AGAINST MUD

Erosive drilling mud cannot eat away vital seating areas of Nordstrom Merchrome coated Hypreseal mudline valves like these installed on mud pump lines.



QUICK EMERGENCY OPERATION

It takes only a quarter turn to operate these Nordstrom three-way Hypreseal valves on blow-out preventer manifold. And Nordstrom lubricant keeps the valves ready to turn. Nordstrom valves on this service are a real safety factor.



NO PLACE FOR SEDIMENT

With Nordstrom valves there are no cavities, pockets or bonnet chambers to catch line sediment and build up a dangerous dam in the line. Nordstrom's straight-through flow plus unexposed seating surfaces are a natural for mudlines.

Nordstrom *Lubricated*

VALVES ARE BEST FOR MUD LINES

Nordstrom Hypreseal Mudline valves are built specifically for use with all types of drilling mud. Their design eliminates the causes for valve deterioration in this difficult drilling service.

Here are three of the reasons Nordstrom valves last up to 10 times as long – by actual field test as ordinary valves in drilling mud service . . .

1. Armor-plated with Merchrome

Nordstrom Hypreseal valves can be had with body and plug seating surfaces coated with an integral layer of Merchrome—an extremely hard non-galling corrosion and erosion resistant special alloy. This means that even the cutting action of abrasive drilling mud has a hard time making a dent in Nordstrom Merchrome valves.

2. Open or Closed in a Split Second

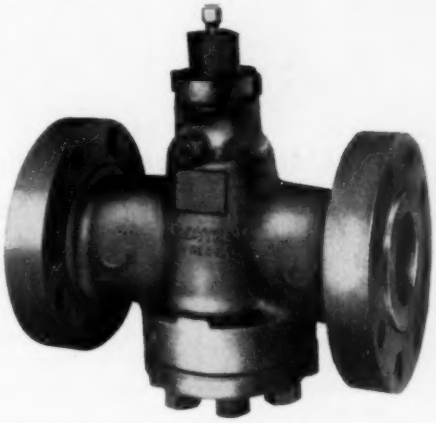
It takes only a quarter turn of the Nordstrom plug to open or close the valve—seconds instead of minutes, and how important that may be in an emergency! The hydraulic jacking action of the lubricant keeps the plug ready to turn.

3. No Sediment-Catching Pockets

Straight through flow with no body or bonnet chambers in which clogging deposits can build up. And, since the seating areas are out of the line of flow, wear is spared on vital parts.

Of course there are other advantages—the sealing film of lubricant around the ports for double tightness, the availability of special Nordstrom lubricants for drilling mud service, the simple, compact, space- and weight-saving design.

Sum it all up this way . . . for drilling service there are no valves like Nordstroms. The best way to convince yourself is to give them a try. Your Nordstrom sales engineer will help you choose the right types for your service. Rockwell Manufacturing Company, Pittsburgh 8, Pa.



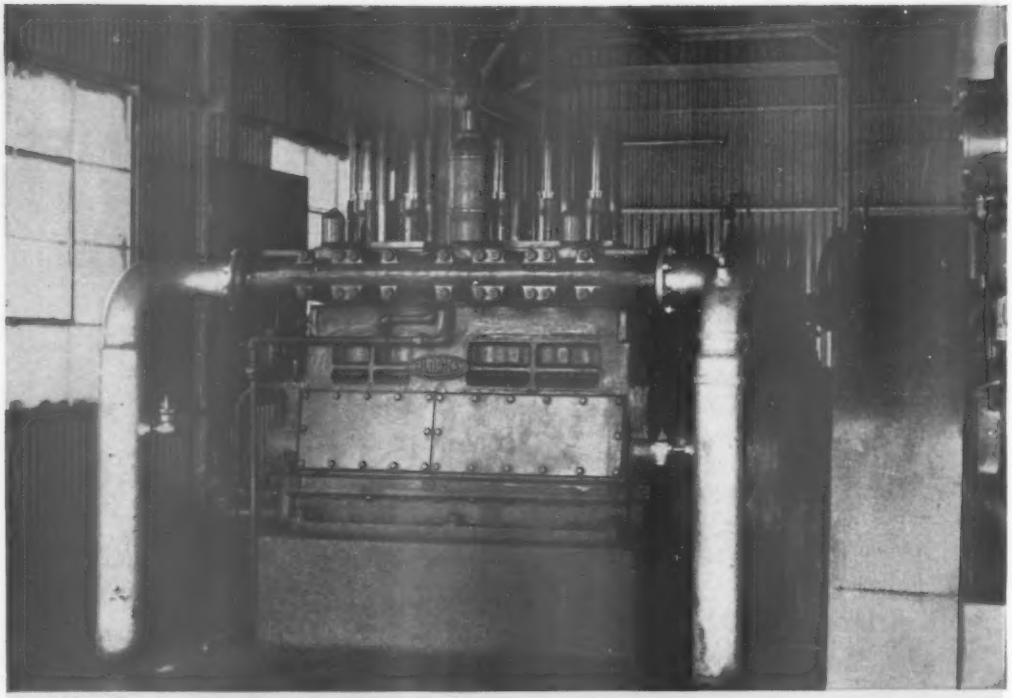
Merchrome hard-faced Nordstrom Hypreseal Mudline valve

Wherever you are in the oil fields, there's a supply store with Nordstrom valves and Nordstrom service nearby.

ROCKWELL Built Nordstrom Valves

Lubricant-Sealed for Positive Shut-Off

Another Rockwell Product



Two Aldrich Direct Flow Pumps Handling Lean Oil at Warren Petroleum Corporation's Gasoline Plant, Ringwood, Oklahoma

These husky Aldrich 3⅛" x 5" Quintuplex Pumps come from the line of standard Aldrich Direct Flow units, available in 3", 5" and 6" stroke sizes, with 3, 5, 7 or 9 plungers. Aldrich Pumps range from 10 to 2400 hp. Pressures are available to meet requirements (up to 15,000 psi or higher).

Here are a few of many advantages offered by Aldrich Direct Flow Pumps:

- Fluid-ends are sectionalized so that parts can be replaced easily and at low cost. Fluid-ends can be made of stainless steel, bronze, Monel, or other materials.
- Plunger sizes are changeable—in most cases merely by using new glands, throat bushings and packing in the same fluid-end.
- Wearing parts are interchangeable among pumps of the same stroke size. And ample stocks of spare parts are maintained at Mid-Continent and California locations.

Applications ... besides lean oil service, include water flooding; salt water disposal; crude, gathering and product lines; bottom hole pump service, and pumping liquid hydrocarbons.

Write for catalogs, engineering service or a representative's call. We invite your inquiries.

THE ALDRICH PUMP COMPANY

9 GORDON STREET • ALLENTOWN, PENNSYLVANIA

...Originators of the Direct Flow Pump

Representatives: P. H. Arden, P. O. Box 185, Glenview, Ill. • Bushnell Controls & Equipment Co., 3929 W. Jefferson Blvd., Los Angeles 16, Calif. • L. T. Gibbs, 509 Petroleum Bldg., Tulsa 3, Okla. • R. B. Moore Supply Co., Inc., Bolivar, N. Y. • Power Specialty Co., 2000 Kipling St., Houston 6, Texas • Reeves & Skinner Machinery Co., 2211 Olive St., St. Louis 3, Mo. Stearns-Roger Manufacturing Co., 1720 California St., Denver 2, Colo. • Export Sales: Petroleum Machinery Corp., 30 Rockefeller Plaza, New York 20, N. Y. • Birmingham • Boston Buffalo • Cincinnati • Cleveland • Detroit • Duluth • Jacksonville • Omaha • Philadelphia • Pittsburgh • Portland, Ore. • Richmond, Va. • San Francisco • Seattle • Spokane, Wash. • Syracuse

SANTOLENE C solves corrosion problem for The Globe Oil & Refining Co.

Globe Oil & Refining Co. tanks

Prior to November 1950, The Globe Oil & Refining Co., Lemont, Illinois, had the usual problem of corrosion in blending tanks.

Today, the corrosion problem is no more, because the Company is using sufficient Monsanto Santolene C, added with inhibitor and metal deactivator as regular and premium gasolines are treated in the blending tanks. Santolene C requires no additional equipment at the Globe Refinery.

Santolene C is product-soluble, burning completely with the fuel. Diesel and gasoline engine tests prove that Santolene C does not reduce engine cleanliness . . . causes no injector fouling . . . has no adverse effect on any factor of engine performance.

If you have a corrosion problem with light petroleum products in storage or transit, investigate Santolene C. For information, write, wire or phone MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 800 North Twelfth Blvd., St. Louis 1, Missouri.

Santolene: Reg. U. S. Pat. Off.

SANTOLENE C

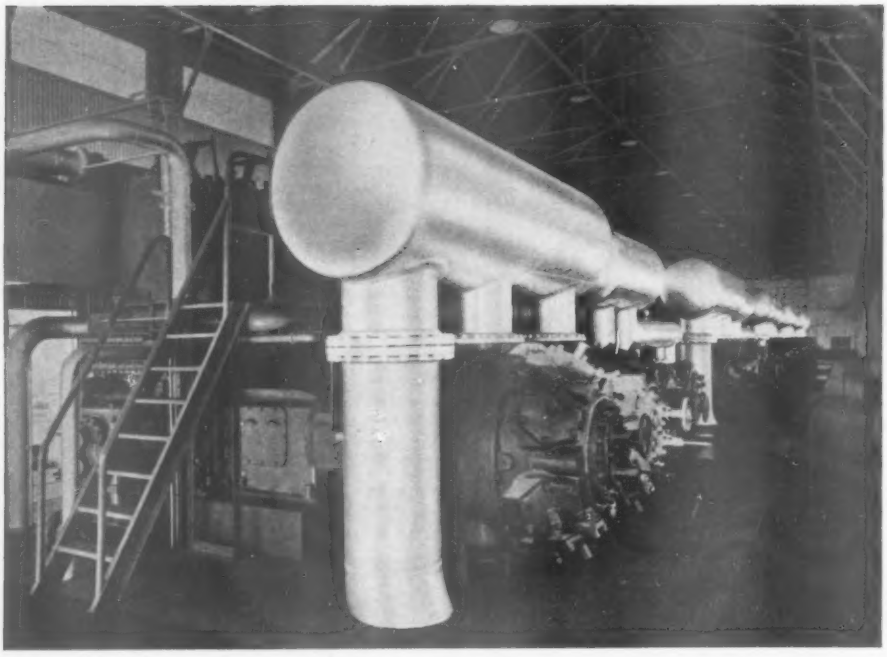
MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

Ringwood gasoline plant now a reality

after 7-year struggle with engineering obstacles

Clark Compressors



© 1952, Clark Bros. Co., Division of Dresser Operations, Inc.

Cut Your V-Belt Costs Right Now!

—this test tells how!

If you want longer V-Belt wear and lower V-Belt costs just make this simple test. Bend any V-Belt that has *straight sides* and—as it bends—*feel* the sides bulge out! (See Fig. 1-A, below)

This out-bulge forces the belt to press unevenly against the V-pulley and of course wear on the belt is concentrated where it bulges most. Naturally this shortens the life of a *straight-sided* V-Belt.

Now, make this same test with the belt that is built with *concave sides*—the Gates Vulco Rope!

See the difference? There is no *out-bulge!* The precisely engineered concave sides *fill out* and become *perfectly straight.* They now *exactly fit* the sheave groove and therefore *press evenly* against the V-pulley. This distributes all wear *uniformly* across the *full width* of the Gates Vulco Rope. And this means longer belt life and *lower belt costs* for you.

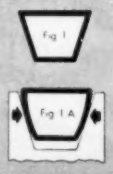
Only V-Belts made by Gates are built with concave sides. Whenever you buy V-Belts, be sure that you get the V-Belt with Concave Sides—the Gates Vulco Rope!

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

This cable tool drilling rig used by driller John E. Mackey, Ada, Mich., was driven by a roller chain. Mr. Mackey reports that drilling shocks transmitted by the chain broke at least three outboard shafts during the digging of every well. Mr. Mackey says, "I've driven two wells since I put V-Belts on this drive and haven't broken any shafts at all. Right there is a saving of over $1000."

What Happens When a V-Belt Bends

Straight-Sided V-Belt



How a Straight-Sided V-Belt Bulges in the Sheave-Groove. Sides Press Unevenly Against the V-Pulley, Causing Extra Wear at Point Shown by the Arrows.

Gates Vulco Rope With Concave Sides

The Concave Sides fill Out to Precise Fit in Sheave-Groove. No Side-bulge! Sides Press Evenly Against the V-Pulley —Uniform Wear and Longer Life!

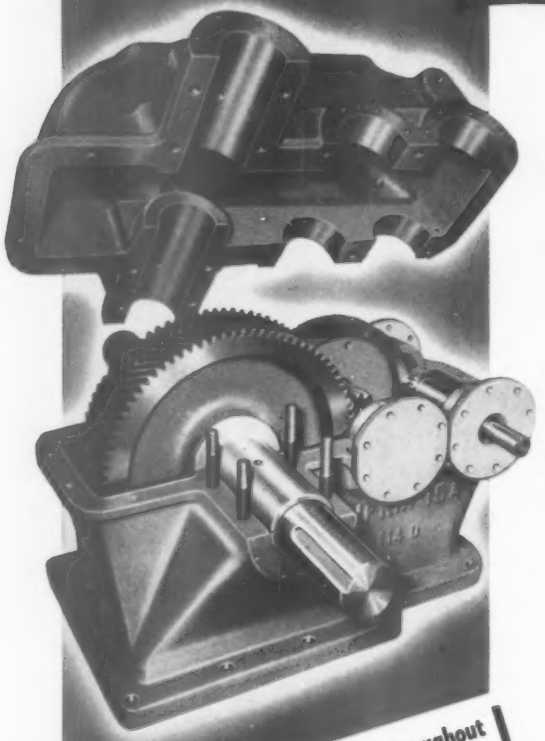
CS-531

Gates® VULCO ROPE DRIVES

THE GATES RUBBER COMPANY • DENVER, U.S.A.

V-Belts — Hose
Molded Rubber Goods
for industry
World's Largest Maker of V-Belts

No "SHIP-IN-A-BOTTLE" construction on a Lufkin TWO-PIECE GEAR HOUSING



Plenty of "BEEF" throughout which is typical LUFKIN DESIGN POLICY

Provides easy accessibility for assembly and inspection

- Allows main gear to be assembled on shaft with heavy 60 ton pressed fit. All rotating parts easily set in place before cover is bolted on. No "threading" of shafts and bearings as necessitated by solid gear box with no split.
- Made of High Tensile Lufkaloy-Iron heavily ribbed inside, giving smooth exterior, pleasing in appearance and easy to keep clean.
- Large Heat Treated Alloy Steel Studs capable of carrying ten times rated load without stretching.
- Large Clean Out Hole for removing sludge from bottom of box.

LUFKIN FOUNDRY & MACHINE COMPANY

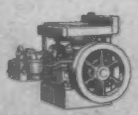
LUFKIN, TEXAS

Branch sales and service Houston, Dallas, New York, Tulsa, Los Angeles, Seminole, Oklahoma City, Corpus Christi, Odessa, Kilgore, Wichita Falls, Casper, Wyoming, Great Bend, Kansas.

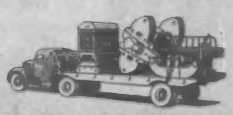
Lufkin Equipment in CANADA is handled by

THE LUFKIN MACHINE CO., LTD., 14321 108th Avenue, Edmonton, Alberta, Canada.

LUFKIN PUMPING UNITS



LUFKIN-COOPER-BESSEMER ENGINES



LUFKIN OIL FIELD AND INDUSTRIAL TRUCK TRAILERS

INDUSTRIAL SPEED REDUCERS AND INCREASERS

DIVISION LUFKIN FOUNDRY & MACHINE CO. INDUSTRIAL, MILL AND AUTOMOTIVE SUPP

For faster, safer clearance that lasts for years

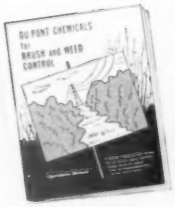
Kill Brush with Du Pont Ammate®

Many users report one spray with Du Pont "Ammate" kills brush so thoroughly that repeat sprays are not needed for years.

In most cases, when the original spray job is done well, brush is kept under control with nothing more than occasional spot sprays starting five or more years later. This assures lower cost brush control with less work for your maintenance crews or custom sprayers.

Here's why "Ammate" works so well.

- **Kills roots of brush as well as tops, yet allows low-growing natural cover to come back.**
- **Control lasts for years, saves labor of hand cutting or annual spraying.**
- **Reducing to a minimum the hazard of damage by spray drift.**
- **Not hazardous to operators, livestock or wildlife. Nonflammable.**

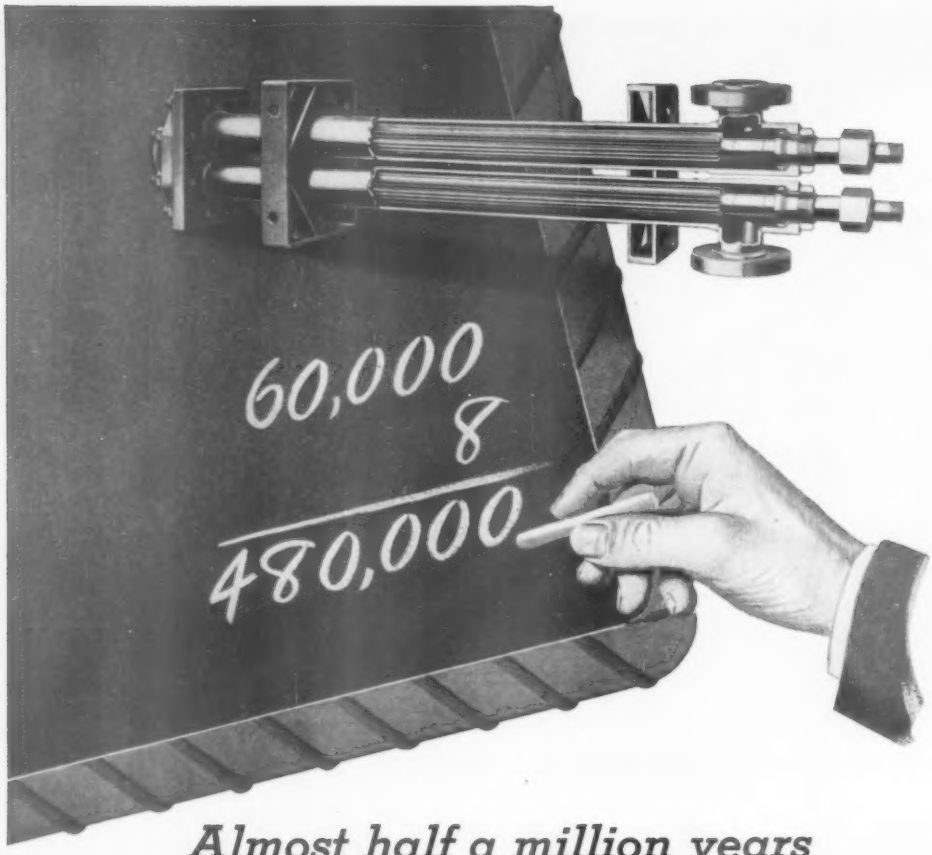


Free illustrated booklet describes how to control brush in rights of way with Du Pont "Ammate." For your copy, write Du Pont, Grasselli Chemicals Dept., Wilmington, Del.

On all chemicals always follow directions for application. Where warning or caution statements on use of the product are given, read them carefully.

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY



Almost half a million years of heat exchanger service!

Multiply the number of installed G-R Twin G-Fin Sections by a conservative estimate for average length of service and that's the figure you get . . . almost half a million total years of service!

Some Twin G-Fin Sections have been in continuous use for more than 20 years. And no matter what the length of service or type of heat transfer duty, here is the uniform report of users . . . effective, durable, troublefree, economical.

Twin G-Fin Sections can be used for a greater variety of services than any other design of heat transfer apparatus . . . that's one of their many advantages. Their installations include almost every type of heating, cooling, condensing, and heat exchange, and with many different liquids, gases and vapors.

Investigate the possibilities in your own plant for these time-proven standard interchangeable heat exchangers with the famous G-Fin elements. Write for bulletin, and ask about their applications to your heat transfer needs.

THE GRISCOM-RUSSELL CO., MASSILLON, OHIO

G-R HEAT TRANSFER APPARATUS **Twin G-Fin Section**

GR 280

WATCHING FOR WIGGLES

INSURES SMOOTH PERFORMANCE OF ENTERPRISE STATIONARY DIESELS

Thorough testing by means of the oscillograph and other scientific instruments, means long engine life—free from vibration troubles.

Vibration at critical speeds can lead to broken shafts, damaged gears and costly engine failure. To check these forces and insure smoothest engine operation, ENTERPRISE DIESELS are *performance-tested* by highly sensitive electronic instruments.

For the finest in dependable pumping power, specify quality-built ENTERPRISE DIESELS—the choice of power experts. Models from 68 to 2056 HP, generator sets to 1402 KW. 3, 4, 6 and 8 cylinders, normally aspirated and turbocharged.

Write for free copy of "Taking The Mystery out of Torsional Vibration," Bulletin ES-B7.

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*Fiberglas and Coromat are trade-marks (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for products made of or with fibers of glass.

63 Owens-Corning Branches assure you fast delivery of Fiberglas Coromat and Outer Wrap . . . Anywhere!*

Geography may complicate your pipeline construction. But it doesn't limit your ability to get the most effective enamel reinforcement you can buy . . . genuine Fiberglas* Coromat and Outer Wrap. Wherever you are—wherever your pipelines go—Owens-Corning branch offices and warehouses are located nearby to give you prompt service.

Coromat gives you extra quality. Permits fast, break-free wrapping—pulls into enamel evenly to form a tough glass-reinforced coating that gives buried pipe maximum protection over the years. Fiberglas Outer Wrap, with its inorganic core of Coromat, cushions enamel against backfill shocks, soil stresses, bumps in handling. Perforated to release air and gases. Keys firmly into enamel.

Caution: All glass wraps are not Fiberglas. Let us show you the differences, and what they mean in terms of better protection for your pipelines. Contact your nearest Owens-Corning branch office. Or write OWENS-CORNING FIBERGLAS CORPORATION, Dept. 54-A5, Toledo 1, Ohio.

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ON YOUR PIPELINES . . . FOR GOOD!

TIMKEN® bearings keep pumpers going in remote areas—reduce spare part needs

OIL is where you find it—often in remote areas like swamps and deserts. That's why you want pumping units that will stay on the go with the least amount of attention. And that's why Alten Foundry & Machine Works mounts the gear reducer shafts of its pumping units on Timken® tapered roller bearings. Alten reports that: "Timken bearings give us unexcelled service, reduce spare part needs."

Timken bearings permit smooth power transmission in the gear reducer. They hold shafts in rigid alignment because their tapered construction permits them to carry radial, thrust and combination loads. Line contact between their rollers and races gives extra load-carrying capacity. Gear mesh is smoother, more accurate. There's less power loss. Shaft wear is eliminated, and wear on gears and other moving parts is reduced.

Housings and shafts are kept concentric by Timken bearings. Closures are more effective, lubricant stays in—dust, mud and moisture stay out. Lubricant and maintenance costs are cut.

There's practically no wear in Timken bearings since true rolling motion and an incredibly smooth surface finish virtually eliminate friction.

For extra value in the oil field equipment you buy or build, specify Timken bearings. No other bearings offer the same advantages. Look for the trademark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

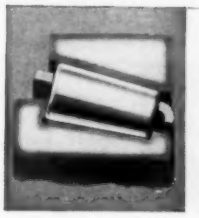
This symbol on a product means its bearings are the best.

THE ALTEN FOUNDRY & MACHINE WORKS, INC. mounts the gear reducer shafts of its pumping unit on Timken tapered roller bearings. Dependable operation in remote areas is assured.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



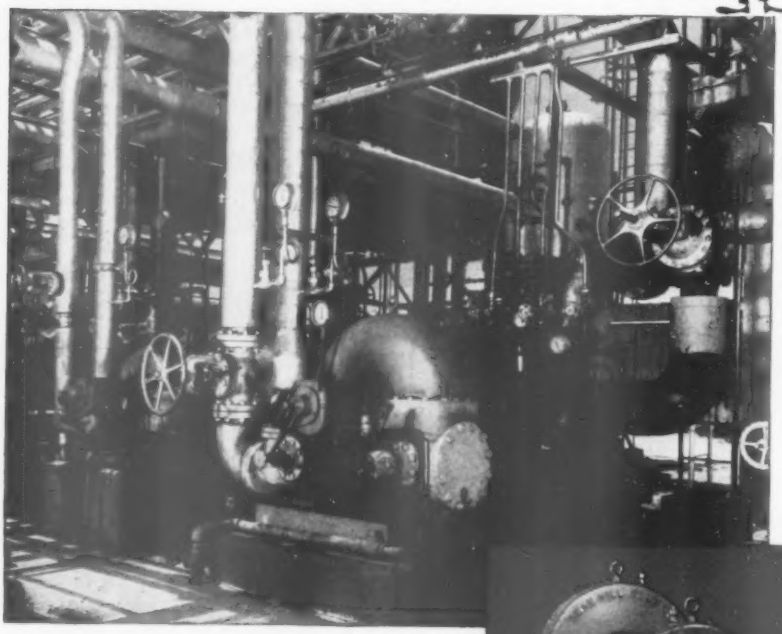
GREATER LOAD AREA

Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer. The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⓘ AND THRUST → ⓘ ← LOADS OR ANY COMBINATION → ✳ ←

How to stretch a "Power Penny"

You'll never know how much power a penny will buy until you get Dean Hill Steam Turbines on the job. Their super rugged construction, their service-engineered design, their low maintenance, their remarkable power-producing ability all add up to more power per penny.



POWER AT WORK

Here are Dean Hill Type DH Steam Turbines at work driving centrifugal pumps at Bay Petroleum Corporation's Chalmette, La. refining operation.

DEAN HILL TURBINES are specifically designed for operation at medium steam pressures. Since they are the single stage, double impact type, low steam consumption is a tremendous economy feature. Steam rates are excellent under these conditions. Get full details and specifications. Write today.

DEAN HILL PUMP COMPANY

Pump and Turbine Engineers Since 1895

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New Polyken Tape BEATS CORROSION

CORROSION CONTROL! Here's positive evidence in this photograph where a test section of pipe has been completely protected by Polyken Tape No. 900 while unprotected pipe is shown in advanced stages of corrosion.

Announcing a superior, exclusive Polyken Tape Coating to help you fight corrosion, reduce down time, give greater protection for more years at the lowest possible cost.

Here's the biggest news in corrosion prevention, of this or any year!

Polyken, long the leader in plastic Protective Tape Coatings for corrosion control, now presents Tape No. 900—a tough, easy-handling, low cost coating that offers greater protection for more years.

Polyken customers helped engineer this new coating—backed up our own 3½ years of product research with their own on-the-job tests.

Apply it by machine, or apply it by hand—either way, Polyken No. 900 goes on *fast*—in a one-step process requiring no heat, liquids, drying time, or clean-up time. Equally effective above or below ground.

Polyken No. 900, black (also available in gray, No. 910)—the new polyethylene plastic tape coating—is made by Polyken's own exclusive process. It's the latest in the line of Polyken Protective Coatings. Mail the coupon today for a free sample and more details.

Superior corrosion resistant qualities of POLYKEN'S Newest Protective Tape Coating

- **33⅓% THICKER FOR GREATER PROTECTION**
  - high puncture and abrasion resistance
  - high dielectric strength
  - increased tensile strength
- **MADE FROM ORIENTED POLYETHYLENE**
  - conforms to odd-shaped surfaces
  - superior moisture vapor barrier
- **NEW ADHESIVE MASS**
  - adhesion doubled
  - superior aging qualities
  - superior high and low temperature performance
- **AVAILABLE IN TWO COLORS**

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INDUSTRIAL TAPES

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Please send me specifications, samples, and further information on Polyken's new Polyethylene Protective Tape Coating No. 900.

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Condor V-Belts–More use per dollar

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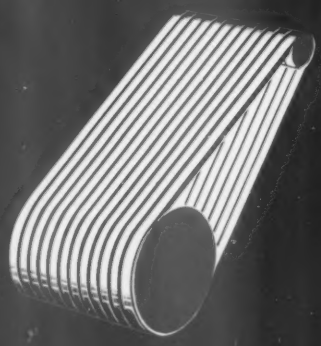
Condor V-Be… per dollar

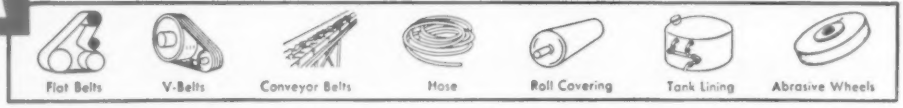


MORE GRIP, LESS SLIP, LONGER LIFE . . . . Yes, you save money with Condor V-Belts on even the toughest multiple belt drive. Straight sidewalls provide more grip, less slip, longer life. They are the smoothest running V-Belts made, because every part is precision-balanced in manufacture. This, too, means longer life. Also in special oil-, heat-, static-resisting types . . . Get the engineering facts. Ask the R/M distributor for Bulletin 6868 . . . He'll tell you, too, how you get MORE USE PER DOLLAR with R/M hose, transmission and conveyor belts.

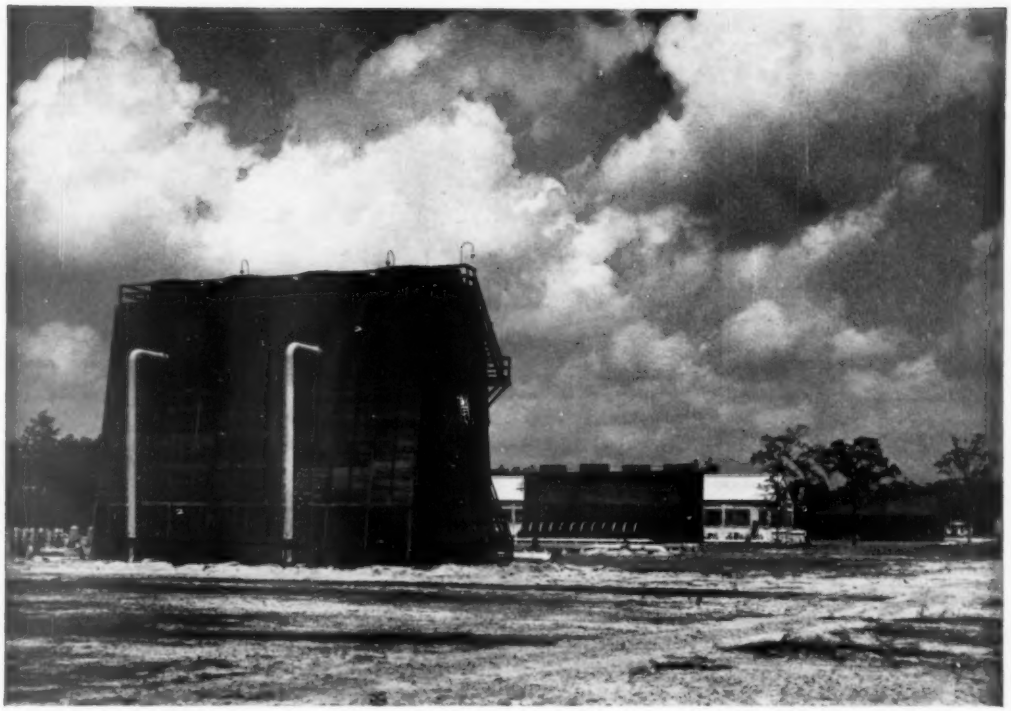
RM

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Teflon Products • Packings • Sintered Metal Parts • Bowling Balls



RE-ORDERS . . .

Bulletins on HUDSON TOP PERFORMANCE cooling equipment mailed upon request.

The three cooling towers pictured above are a part of EIGHTY large Hudson cooler installations made by a gas transmission company—installations involving HUDSON cooling towers, atmospheric sections and HUDSON Solo-aire units made in eight different states from Texas to New York.

The fine performance, low operating cost, mechanical excellence, and good business relations experienced by buyers of Hudson equipment, make Hudson the favored supplier when additional installations are considered. Over SEVENTY-FIVE PERCENT of Hudson cooling equipment now being manufactured will be installed for present users.

HUDSON
ENGINEERING CORPORATION
FAIRVIEW STATION • HOUSTON, TEXAS

HUDSON

op erformance

COOLING EQUIPMENT

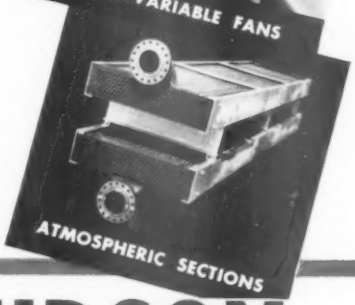
For more than two decades HUDSON personnel have developed equipment for heat recovery and heat dissipation. Present day HUDSON cooling equipment has been evolved through the years by constant improvements in design and fabrication.

COOLING TOWERS

SOLO-AIRE EXCHANGERS

COMBIN-AIRE UNITS

AUTO-VARIABLE FANS



ATMOSPHERIC SECTIONS

COOLING TOWERS

Beauty and utility have been successfully combined in the HUDSON "TP" design. These Top Performance cooling towers embodying new but proven advancements in water cooling design, result in lower installation and operating costs for a given guaranteed performance.

SOLO-AIRE EXCHANGERS

HUDSON Solo-aire exchangers for jacket water cooling, gas cooling, steam condensing and hydrocarbon vapor condensing have found wide use, particularly where suitable cooling water is impossible or expensive to obtain. Even where adequate quality and quantity of water is available there are conditions under which these units have marked advantages over alternative cooling methods. Designs are available for pressures up to 5,000 pounds per square inch.

COMBIN-AIRE UNITS

By combining in one structure Solo-aire units with a cooling tower, HUDSON originated the Combin-aire unit. In hot weather, air before use in the Solo-aire units, is contacted with water to reduce both air and water temperature. In cold weather, water use is unnecessary. This device makes possible the use of air for low temperature cooling, allows use of untreated water, minimizes water consumption, and results in capital and operating savings.

AUTO-VARIABLE PITCH FANS

The latest in a long list of Hudson innovations. The auto-variable pitch fan controls cooler outlet temperature through automatic change in fan blade pitch, which in turn changes air volume across cooler tubes. Outlet temperature is closely controlled, and in a typical case horsepower consumption over the year is reduced seventy percent as compared with fixed pitch fan operation.

ATMOSPHERIC SECTIONS

These units are for use where water serves as cooling medium. They may be mounted vertically or horizontally, under cooling tower or submerged in water.

UNDIVIDED RESPONSIBILITY—***Complete integration of facilities in selection, design and manufacture of cooling towers, water cooled atmospheric sections, and air cooled exchangers results in cooling systems of minimum first cost, minimum operating cost, and in undivided responsibility.***

HUDSON

ENGINEERING CORPORATION

FAIRVIEW STATION • HOUSTON, TEXAS

526* years of experience back of every Eastman job!

...the big reason why Eastman Oil Well Survey Company excels in Oil Well Surveying and Directional Drilling Service.

*526 years, the combined total of experience of Eastman Engineers

Call an Eastman Engineer today; He's ready to serve you Anywhere, Anytime!

Eastman Oil Well Survey Company

LONG BEACH DENVER HOUSTON

Export Sales and Service:
EASTMAN INTERNATIONAL COMPANY
P. O. Box 1500 Denver, Colorado

DIRECTIONAL DRILLING Eastman OIL WELL SURVEYS

When it takes a LADDER to reach the cookie jar...

LANE-WELLS

is the "plus value" shaped-charge perforating because it gives you ALL the rungs!

ACCURATE DEPTH MEASURE

ON-THE-DOT SERVICE

20 YEARS EXPERIENCE

THOROUGH LOCAL KNOWLEDGE

SAFETY ASSURED

DEEP PENETRATION

Deep Penetration is just one of all these very important steps

Call LANE WELLS and get the job done RIGHT!

General Offices, Export Office, Plant 5610 So. Soto Street, Los Angeles 58

AK-501

LOS ANGELES • HOUSTON • OKLAHOMA CITY • LANE-WELLS CANADIAN CO. IN CANADA • PETRO-TECH SERVICE CO. IN VENEZUELA

To keep production moving, keep valve quality high

FIG. 123
N·M·D
(Non-Metallic-Disc)
BRONZE VALVE

Correctly engineered for long life in handling steam, hot water, cold water, air and gas, oil, gasoline, butane, propane.

Any plant, regardless of type or size, uses valves—bronze, iron, or steel. Industry relies on Lunkenheimer Valves that stay on the job, year-in, year-out . . . helping sustain continuous peak production. And that's why Lunkenheimer quality is so essential today.

Industry's faith in Lunkenheimer Valves is based on nearly a hundred years of experience with Lunkenheimer design, materials, and workmanship.

BRONZE • IRON • STEEL

LUNKENHEIMER
THE ONE *Great* NAME IN VALVES

L-152-2o

ANNOUNCING

A new Dodge truck parade of power!

NEW! More powerful engines!

A parade of power! See the new Dodge "*Job-Rated*" trucks at your Dodge dealer's today. A total of 7 big, rarin'-to-go engines, including 3 brand-new power plants with high compression ratios and higher horsepower, greater cooling capacity, increased displacement, twin carburetion available on larger models. Plus famous features like 4-ring pistons with chrome-plated top ring, exhaust valve seat inserts.

In addition, the new Dodge trucks offer outstanding new brakes, new no-shift transmission, and over 50 other new features. See your Dodge dealer for the biggest truck buy on record!

For a truck, ½-ton through 4-ton that fits the job, see the NEW...

NEW! Extra-powerful brakes!

Stop easily on steep grades, fully loaded. Super-safe brakes give silky-smooth braking, reduced driver fatigue, greater load protection . . . new increased stopping ability on 1- through 2½-ton trucks! *PLUS* Dodge's oversize braking surface with Cyclebond linings.

NEW! Truck-o-matic transmission!

New Truck-o-matic transmission . . . available on ½- and ¾-ton models of Dodge "*Job-Rated*" trucks . . . saves shifting, cuts driver fatigue, lets you rock out of snow, mud, sand. Only Dodge offers shift-free Truck-o-matic! *PLUS* famous gyrol Fluid Drive, to lengthen truck life, protect your load.

NEW! Over 50 features!

50 ways new! Reinforced cab construction, improved exhaust system, extra-capacity radiators. Tinted glass, heaters with stepped-up heat output available. *PLUS* moistureproof ignition, high-torque capacity starting motors, and other dependability features. See your Dodge dealer.

DODGE "Job-Rated" TRUCKS *Now on display at Your Dodge Dealers!*

GROWING

STATEMENT OF CONDITION

At the Close of Business December 31, 1952

ASSETS

Cash on Hand and Due from Banks	$211,595,895.41
United States Securities Owned	108,448,400.27
State, County and Municipal Bonds	11,771,963.22
Stock in Federal Reserve Bank	900,000.00
Housing Authority Bonds (Guaranteed)	6,652,755.61
Other Bonds	67,100.00
Loans and Discounts	221,190,919.68
Income Accrued	1,047,993.60
Letters of Credit and Acceptances	8,255,918.08
Banking House and Equipment	5,202,472.19
Other Assets	52,957.39
	$575,186,375.75

LIABILITIES

Capital Stock	$15,000,000.00	
Surplus Fund	15,000,000.00	
Undivided Profits	4,139,639.31	$ 34,139,639.31
Reserved for Contingencies		3,180,485.83
Reserved for Taxes, Etc.		3,040,628.18
Deferred Income		470,000.57
Letters of Credit and Acceptances		8,255,918.08
DEPOSITS:		
Individual	$310,998,606.02	
Banks	198,055,951.15	
U. S. Government	17,045,146.61	$526,099,703.78
		$575,186,375.75

77th year of dependable personal service

EQUAL OPPORTUNITY TO SAVE

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HONORARY CHAIRMAN OF THE BOARD

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NATIONAL BANK in DALLAS

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

CONTINENTAL'S Line is Complete

CONTINENTAL MOTORS
Powerful as the Nation
AMERICA'S STANDARD

INDUSTRIAL GASOLINE ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
N56	4	2⅛	3½	56	14.2 @ 2200 RPM
N62	4	2⅜	3½	62	15 @ 2200 RPM
Y69	4	2½	3½	69	21.4 @ 2400 RPM
Y91	4	2⅞	3½	91	28.5 @ 2400 RPM
Y112	4	3⅛	3½	112	32 @ 2400 RPM
F124	4	3	4½	124	36 @ 2400 RPM
F140	4	3⅛	4½	140	42 @ 2400 RPM
F162	4	3⅜	4½	162	49 @ 2400 RPM
F186	6	3	4½	186	60.5 @ 2400 RPM
F209	6	3⅛	4½	209	68 @ 2400 RPM
F226	6	3⅜	4½	226	73 @ 2400 RPM
F244	6	3⅜	4½	244	79 @ 2400 RPM
M271	6	3½	4½	271	86.2 @ 2400 RPM
M290	6	3¼	4½	290	92.2 @ 2400 RPM
M330	6	4	4½	330	104.4 @ 2400 RPM
B371	6	4⅛	4½	371	110 @ 2400 RPM
B427	6	4⅜	4½	427	127 @ 2400 RPM
G134	4	3½	4½	134	32.2 @ 2000 RPM
G157	4	3½	4½	157	37.7 @ 2000 RPM
H227	4	3⅝	5½	227	54 @ 2000 RPM
H243	4	3¾	5½	243	58.2 @ 2000 RPM
*H260	4	3⅞	5½	260	62 @ 2000 RPM
T371	6	4⅛	4½	371	119 @ 2400 RPM
T427	6	4⅜	4½	427	140 @ 2400 RPM
U501	6	4½	5½	501	160 @ 2400 RPM
R513	6	4½	5½	513	164.3 @ 2400 RPM
R572	6	4¾	5½	572	182.4 @ 2400 RPM
R602	6	4⅞	5½	602	191.7 @ 2400 RPM
S749	6	5½	5½	749	217 @ 2200 RPM

INDUSTRIAL DIESEL ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
GD157	4	3½	4½	157	39 @ 2000 RPM
HD243	4	3¾	5½	243	54.7 @ 2000 RPM
*HD260	4	3⅞	5½	260	59.3 @ 2000 RPM
TD427	6	4⅜	4½	427	106.5 @ 2000 RPM
RD572	6	4¾	5½	572	142.5 @ 2000 RPM
SD802	6	5⅜	5½	802	184.3 @ 1800 RPM

*Available for Industrial applications only.

35 INDUSTRIAL MODELS

14 to 217 Horsepower
Assure the RIGHT Engine for Every Oil Field Job

One good reason for choosing Continental oil field power is the exceptional completeness of the Continental Red Seal line. The industrial series, for instance, comprises 35 different basic models, with an output range from 14.2 h.p. up to 217. Six of these are full Diesels with exclusive Continental Cushioned Power. Continental Red Seals—single or compounded—are getting the call for more and more types of oil field applications, in drilling, distributing and processing, by reason of this specialization—by reason of the fact that Continental builds exactly the right engine for the job.

... PARTS AND SERVICE EVERYWHERE

Continental Motors Corporation
MUSKEGON, MICHIGAN

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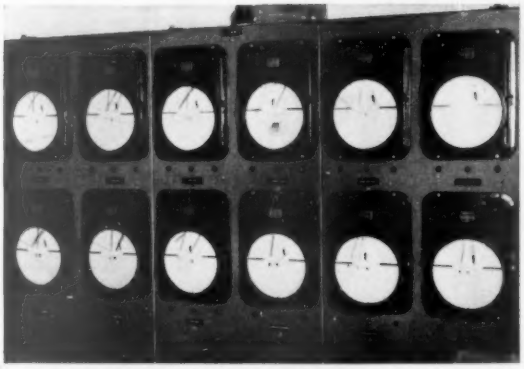
GAS DISPATCHING MADE EASIER



THESE BRISTOL METAMETER RECEIVERS are in the dispatcher's office of Colorado Interstate Gas Company.

AREA COVERED BY BRISTOL METAMETER TELEMETERS. This installation has been in operation for four years.

by Bristol Metameter* telemeters and remote control

No matter how far-flung and complex a pipe line system may be, critical pressures and flows all along the line can be observed and controlled from a central point by Bristol Metameters.

The use of Metameters by the Colorado Interstate Gas Company is typical. Bristol Metameter receivers in its Colorado Springs dispatching office record suction and discharge pressures at nine of the compressor stations along its 555 mile gas pipe line and the flow and static pressure at five of its metering stations.

These Metameter telemeters give the dispatcher a clear picture of pressure and flow conditions along the entire pipe line.

Many other pipe line and gas companies from coast to coast use Bristol Metameter to obtain up-to-the-minute knowledge of what is going on throughout their systems and maintain finger-tip control over any combination of conditions that may arise. Several installations have been in operation over 15 years.

Use by pipe line companies includes (in addition to those mentioned above) remote setting of regulators and flow controllers; remote readings of pressure at transfer point and flow of gas into distribution system; sounding alarms when low and high limits of pressure and flow are exceeded; totalizing flow through several lines. Readings are transmitted over any two-wire circuit or its equivalent (private wires, telephone circuits, carrier channels and radio, including microwave). Receivers may be recording (narrow or wide strip or round chart) or indicating.

For further information on the use of Metameters by pipe line and gas companies, from coast to coast, request Bulletin M1700, THE BRISTOL COMPANY, 120 Bristol Road, Waterbury 20, Conn. *Reg. U. S. Pat. Off.

BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

RIGHT AT THE BEGINNING--

plan to protect your pipe line against corrosion!

...include Bitumastic® Enamel in your original planning

ANY pipe line, whether large or small, is a big investment—an investment that should be properly protected.

That's why it's wise, when planning a new pipe line, to include Bitumastic Enamel in your design plans and specifications. Bitumastic Enamels, manufactured from selected coal-tar, have proved they can prevent corrosion. Many oil and gas pipe lines, laid 20 and 30 years ago, are still giving good service today, thanks to these durable Enamels.

Why not let your Koppers representative work with you from original planning through to final operations? He will be glad to assist you to get the most out of your protection dollar by giving you complete details and estimates.

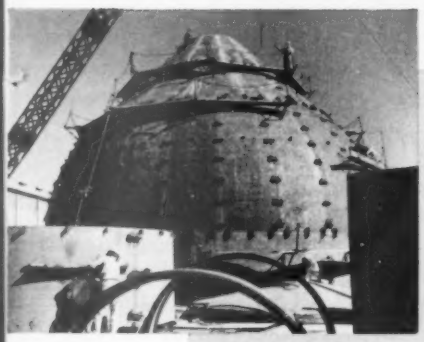
KOPPERS BITUMASTIC ENAMELS

REG. U.S. PAT. OFF.

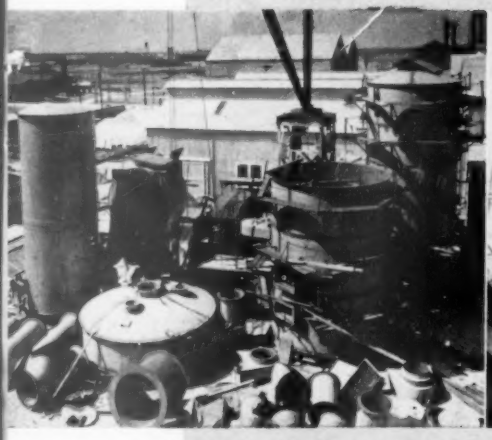
KOPPERS COMPANY, INC., Tar Products Division, Dept. 103-T, Pittsburgh 19, Pa.

DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.

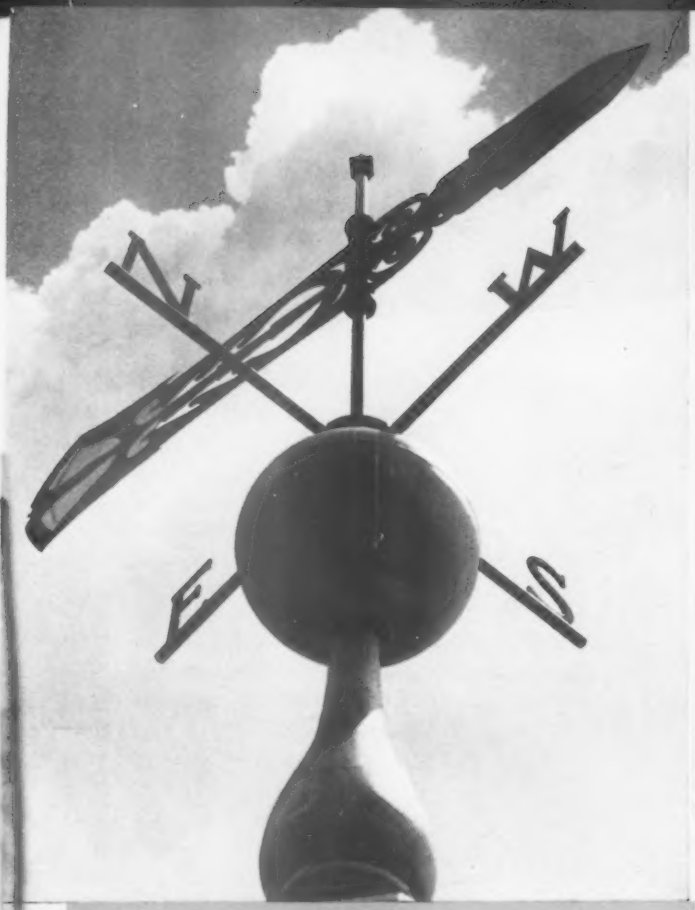
Sentinels of Fine Fabrication and Dependable Field Erection



● These WYATT fabricated and erected products are producing better things for better living. A regenerator is being fit-up and matchmarked prior to shipment for field erection . . . A battery of horizontal pressure storage tanks . . . A sulphuric acid plant on which fabrication started in our plant, ended in the field . . . Atmospheric and vacuum towers nearing completion in a refinery . . . Carbon-black storage bin, too large for one-piece shipment, erected on final location.



STEEL PLATE FABRICATORS AND ERECTORS SINCE 1913



A Four-Way Selection

This photograph of a weather vane seems a good way to point out the fact that there are four different types of Midwest Welding Elbows (see below). These are more types than are manufactured by any other company. This greater selection is important to users of welded piping because it gives the engineer greater latitude in piping design and permits improvements and economies not otherwise possible in welded piping systems. For more information on this subject, ask for Catalog 48.

MIDWEST PIPING & SUPPLY CO., INC.
Main Office: 1450 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Passaic, Los Angeles and Boston
Sales Offices:
New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 33—320 Anderson St. • Houston 2—1213 Capitol Ave.
Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

MIDWEST "LONG TANGENT"
Same radius as ASA but tangent equal to 25% of nominal pipe size on each end. Saves pipe, layout and welding time. Costs no more than ASA. Sizes to 24".

ASA STANDARD
Dimensions conform to applicable size range of American Standard for Butt-Welding Fittings. ASA B16.9. Tolerances much less than allowable. Sizes to 26".

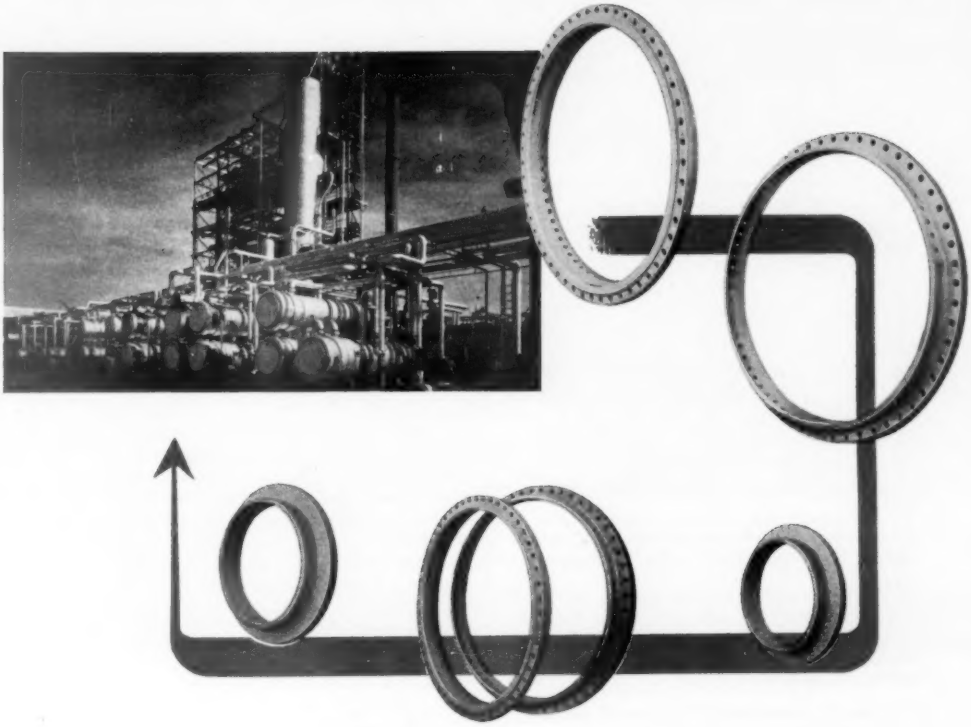
SHORT RADIUS
Recommended where space is limited. Sizes to 30". Also available with "Long Tangents" in sizes 14" to 30".

MIDWEST REDUCING
Takes the place of a straight size elbow and a reducer. Eliminates one weld, reduces pressure drop, easier to insulate. Sizes to 12", reductions to half size.

MIDWEST WELDING FITTINGS

IMPROVE PIPING DESIGN AND REDUCE COSTS

6105



there's a **Railway Steel Flange**

for your application!

Railway Steel flanges are made from carbon and alloy steels for just about every job in the petroleum and gas industries . . . all the regular standard types of flanges, as well as special types, including those built to TEMA standards. Railway Steel flanges are available in a wide range of sizes and types from 18 in. ID to 150 in. OD.

Our own high quality carbon and alloy steels are used in the production of Railway Steel flanges. Every step in fabrication from the production of the steel through forging, rolling, heat treating and machining is under rigid control to assure you flanges that will give maximum protection to your products and processes.

Sales representatives in New York, Richmond, Cleveland, Chicago, St. Louis, St. Paul and San Francisco will be glad to provide you with complete information about these superior flanges for your applications.

Brake rims, gear blanks and other circular forgings are also available for many types of service—all made of our own steels for your protection.

Railway Steel Flanges

RAILWAY STEEL-SPRING DIVISION

AMERICAN LOCOMOTIVE COMPANY

Graphic Instrumentation . . . *from idea to installation*

SIMPLER supervision, greater operating efficiency . . . improved coordination . . . these are some of the contributions that graphic instrumentation is making in the process industries. Recognizing the ever increasing importance of graphic techniques, Honeywell offers complete engineering service . . . covering instrumentation, panel design, and construction.

Instruments

Tel-O-Set miniature indicators and recorders are supplied for temperature, pressure, flow and liquid level. They take a front-of-panel space only 5 inches square . . . fit readily into process diagrams. They meet the most critical demands for accuracy, simplicity, and utility.

Behind the panel are compact *Tel-O-Set* Controllers. They provide a choice of control actions.

Console desks, with integrally-mounted *ElectroniK* Precision Indicators, give operators a convenient means of monitoring a large number of critical temperatures.

For remote transmission, Honeywell has a full line of temperature, pressure, flow and level transmitters and receivers of both pneumatic and electric types . . . working with a broad selection of sensing elements.

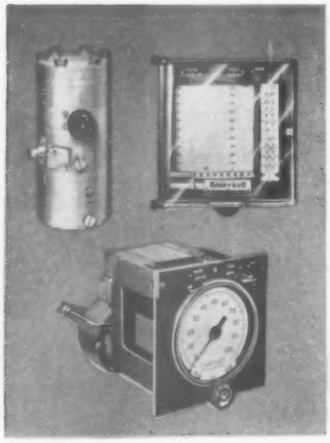
Panel Design

Every panel is custom-designed for its intended job by Honeywell's staff of panel engineers. After initial consultations, they develop a layout that fits all instruments, signals, remote control stations and other equipment in a coordinated design. All elements are located for greatest convenience and ease of manipulation. The overall appearance is made attractive and simple to follow, to aid in reducing operator fatigue. Final working drawings are prepared following consultation with the customer . . . then actual fabrication begins.

Panel Construction

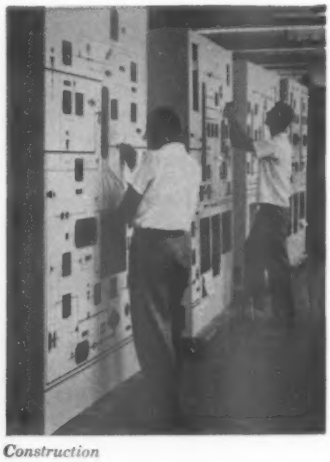
In Honeywell's shop devoted exclusively to panel production, skilled workmen do a complete assembly job. Every instrument, controller and accessory is mounted in place. All back-of-panel wiring and piping is completed, so the board is ready to connect to plant equipment. Before shipment, the entire panel goes through rigorous tests to assure trouble-free installation and start-up when the panel reaches its destination.

Squeezing out with the

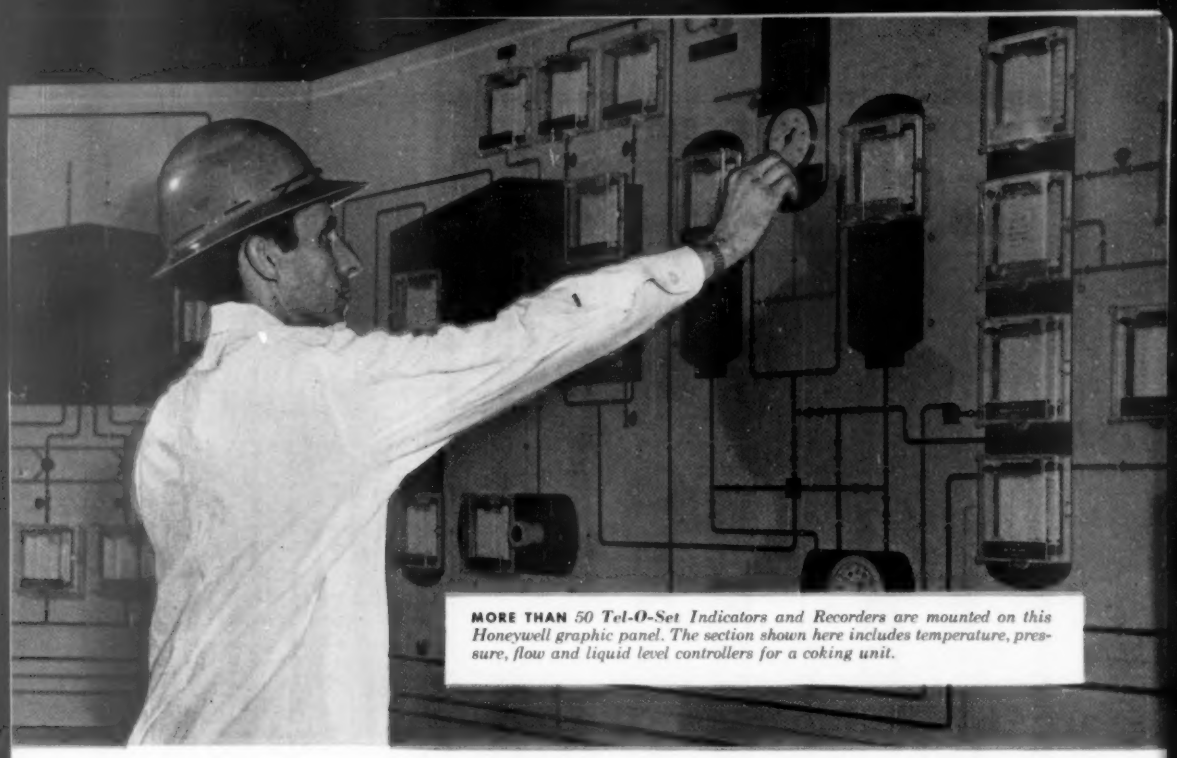


Instruments

Design



Construction



MORE THAN *50 Tel-O-Set Indicators and Recorders are mounted on this Honeywell graphic panel. The section shown here includes temperature, pressure, flow and liquid level controllers for a coking unit.*

higher yields — help of *centralized control*

DESIGNED to upgrade reduced crude, the Lummus coking unit at a big refinery gets the last useful drop out of feed stock. Centralized control, by means of a Honeywell graphic panel, keeps all critical process variables in line...simplifies supervision of the entire process.

Accurate control pays dividends here. In fractionation, it helps to obtain maximum throughput and quality of the desired cuts, and to get proper composition of the coking furnace feed. In the coking furnace, precise control prevents formation of coke in the furnace tubes, assuring efficient operation.

Tel-O-Set recorders, installed in the process diagram, give operators precise, readily readable facts on each variable. And behind the panel, their companion *Tel-O-Set* controllers automatically regulate critical variables throughout the unit. The entire panel functions as one giant instrument . . . functional but attractive in appearance . . . efficient and precise in operation.

Our local engineering representative will be glad to discuss how panels by Honeywell can help you get the most from your process. Call him today . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*. 4488 Wayne Ave., Philadelphia 44, Penna.

● **REFERENCE DATA:** Write for Composite Catalog No. 5000 for a condensed description of the complete Honeywell line.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

FOR TODAY'S CABLE DRILLING and PACKING DEMANDS CHOOSE SPANG TOOLS...

and Give Them Proper Care!

SPANG CABLE TOOLS and PACKERS

made by SPANG & CO., Butler, Pa.

For

OIL WELLS • GAS WELLS • ARTESIAN WELLS
SHOT BLAST HOLES • PROSPECT DRILLING

"FACE" IT – FOR ADDED SUB-SURFACE TIME!

More than twenty Airco Hardfacing rods are ready to help you beat today's replacement delay. Full equipment protection with Airco Hardfacing Alloys . . . for new parts and old . . . keeps you free of cut-backs, or loss of day-to-day production.

Parts and tools – fishtail bits . . . roller bits . . . core heads . . . wall scraper blades . . . drag type bits – stay on the job longer, even at peak production, their life extended many times with *Airco Hardfacing Alloys.*

For further information, write today!

AIRCO

AIR REDUCTION MAGNOLIA COMPANY

A Division of Air Reduction Company, Incorporated

2405 Collingsworth Avenue, Houston 10, Texas

Beaumont • Corpus Christi • Dallas • El Paso • Fort Worth • Hobbs
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AN AIR REDUCTION PRODUCT

at the frontiers of progress you'll find

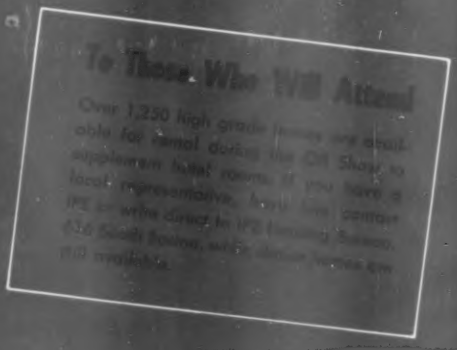
Southwestern Headquarters for Oxygen, Acetylene and Other Gases . . . Carbide . . . Gas Welding and Cutting Machines, Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

Thirtieth Anniversary

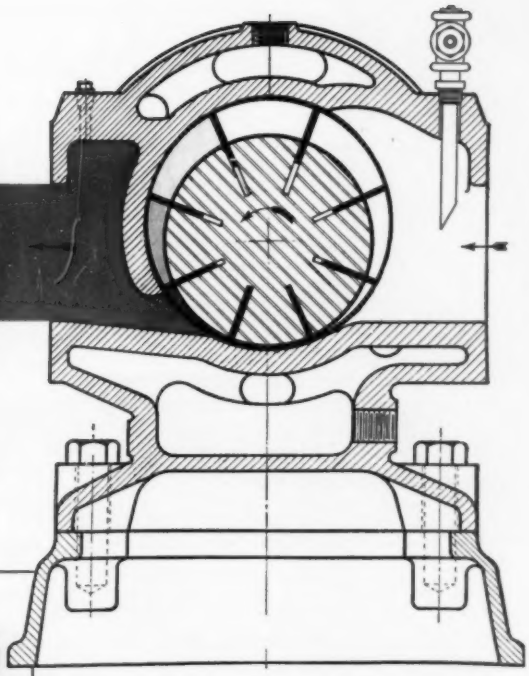
TULSA

MAY 14-23
1953

EXPLORATION
DRILLING
PRODUCTION
PIPE LINE
REFINING
SCIENTIFIC



putting the squeeze on compression costs



Check your needs for •••• *Gas Gathering* • *Gas Boosting*
Repressuring Flare Gas
Refrigerant Compression • *Engine Starting Air* • *Pneumatic Power*
Pneumatic Controls • *General Plant Air*

When you consider all the many uses you have for compressors—consider the best way to get compression with dependability, and minimum cost and attention.

Fuller Rotary Compressors have so many inherent advantages that they warrant your closest examination. Free from reciprocating parts, with no valves to leak or seats to grind, no unbalanced forces to set up vibration. Fuller Rotary Compressors assure low-cost, smooth-flow operation during their long life.

Check your own compressed-air needs and send this check list to Fuller. A Fuller engineer will give you the *right* recommendation to save you money. Write now to Fuller Company, Catasauqua, Penna.

Fuller **Pioneers of high-efficiency vane-type rotary compressors**

FULLER COMPANY
Catasauqua, Pa.
Branch Offices: Chicago • San Francisco • Los Angeles • Seattle • Birmingham

C-231
1950

It's the end result that tells the profit story!

Argo Oil Corporation Increases Stock Tank Recovery Over 50% During 2-Month Test Period

Argo's South Texas installation... BS&B Glycol Injection System of Low Temperature Separation with Stabilizer. This equipment is paying off at the stock tank... is recovering more condensate... is saving products formerly wasted.

. . . and here's the end result!

Portable Separator Unit test showed stock tank recovery was 19.75 barrels per MMSCFD of sales gas. The 1st stage separator was operated at 800 p. s. i. at 70° F.

But look what happened when the BS&B Glycol Injection System with Stabilizer was installed

OPERATIONAL DATA:

Inlet flowing conditions	2250 p. s. i. @ 120° F.
Flow rate	5.1 MMSCFD
Separator pressure	940 p. s. i.
Separator temperature	10° F.
Water content of sales gas	2.3 lbs. per million
Vapor pressure stock tank oil	14 p. s. i. (RVP)
Stock tank recovery	31.03 Barrels per MMSCF of sales gas

Increased Recovery ***57%***

Increased Daily Revenue ***$161.06***

BS&B Glycol Injection System OF LOW TEMPERATURE SEPARATION with STABILIZER*

BS&B . . . for 60 years a leader in oil and gas producing and refining equipment...also manufacturers of Climax Controls, Safety Devices and special fabricated pressure vessels. Ask your BS&B Man. There's one of BS&B's 35 Branches or 17 Sales Offices near you if you're in the Oil Country, or write

* Patented and Patents Pending

EFFICIENCY BS&B RELIABILITY

BLACK, SIVALLS & BRYSON, INC.

Oil & Gas Equipment Division, Dept. 1-A1

2131 Westwood Blvd. Oklahoma City, Oklahoma

Down time got you down?

You Need Improved

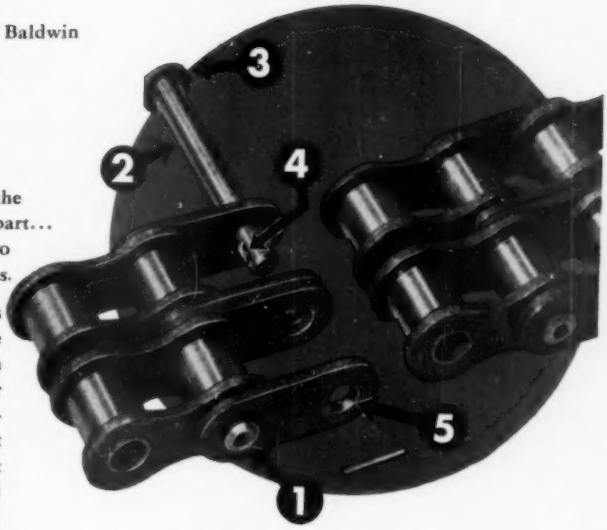
Baldwin Assembly Riveted Roller Chain!

There's no doubt about it...with Improved Baldwin Assembly Roller Chain you can drastically reduce down time...drill more feet of hole per day...make more profit per job.

Here's why...

The Improved Baldwin Assembly features the *Single Pin Coupler Link*...it's easy to take apart... easy to install...easy to repair...and easy to spot because of its straight edged side plates.

One end of the single pin coupler link is firmly riveted to the adjacent link (1). The other end contains the unique Coupler Pin (2). One end of this pin is spun over a washer (3). The other end has a milled flat and locking pin (4). The Coupler Pin is an easy fit through the chain except for the milled flat end which is press fitted through the special matching hole (5) in the coupler link plate. Thus, you have to drive the pin only the length of its milled flat in coupling or uncoupling the chain.

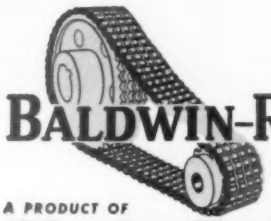


THIS CHAIN LASTS FAR LONGER . . . . it's a riveted chain, with all the riveted advantages. No "sloppy" pin fits to cause quick wear...premature failure.

IT'S "MADE UP"...NOT "CUT UP"

You can *make up* Baldwin Assembly to any length chain you need. It comes boxed in 10-foot lengths with the exclusive single pin couplers installed at convenient intervals. Each box contains a chart which shows you quickly and easily which sections to use to get the exact length or number of pitches you need.

For all the facts, see your local supply store or mail the coupon for your copy of our new Oil Field Chain Bulletin 52-3. Baldwin-Rex Oil Field Sales Offices located in New York • Tulsa • Dallas Houston • Midland • Los Angeles



BALDWIN-REX ROLLER CHAINS

A PRODUCT OF

Chain Belt COMPANY OF MILWAUKEE

Chain Belt Company 52-425X
4619 W. Greenfield Ave.
Milwaukee 1, Wis.
Please send me Bulletin 52-3.

Name.....

Company.....

Address.....

City.....*State*.....

How can you benefit

from these 34 major pipelines?

How? By applying to your future operations the electrical features developed for these 34 major oil and gas lines. Westinghouse is the source for this information.

Centralized automatic control

For example, in one new Westinghouse-equipped pumping station, centralized automatic control has been applied. The mere pressing of three buttons by a single employee, performs twelve operations in six minutes, that would normally take two or three men an hour. The savings in manpower and increase in revenue through fast starting are tremendous. And there's no chance of damage through opening valves in the wrong order.

Highly flexible and reliable operation

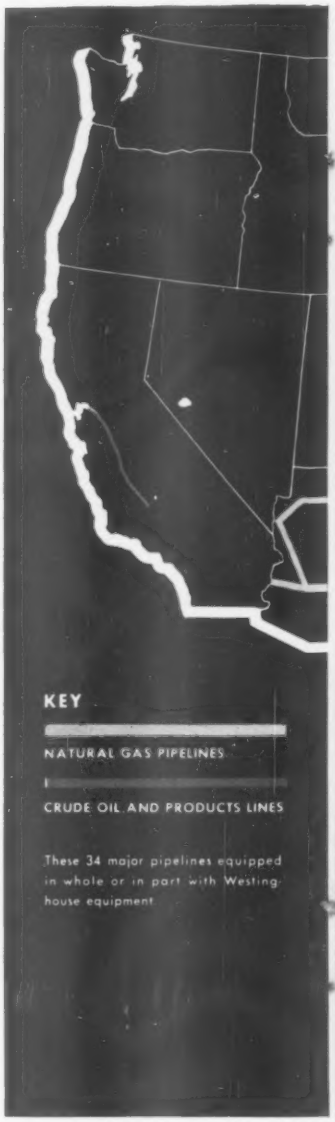
Electrical control has been developed that makes it easier to maintain operating schedules. With such control, all pumping stations can be more easily operated in step. This eliminates the need for storing successive pumpings in balance tanks with the resultant interbatch contamination.

Advancements in Power Systems

Westinghouse has made major advancements in Power Systems for pumping stations. All high-voltage equipment can be enclosed in metal-clad switchgear. This saves installation dollars, makes maintenance more convenient, and provides the ultimate in safety to personnel. The low-voltage circuit breakers and motor controls are centralized in compact Control Centers.

Call Westinghouse early when you plan

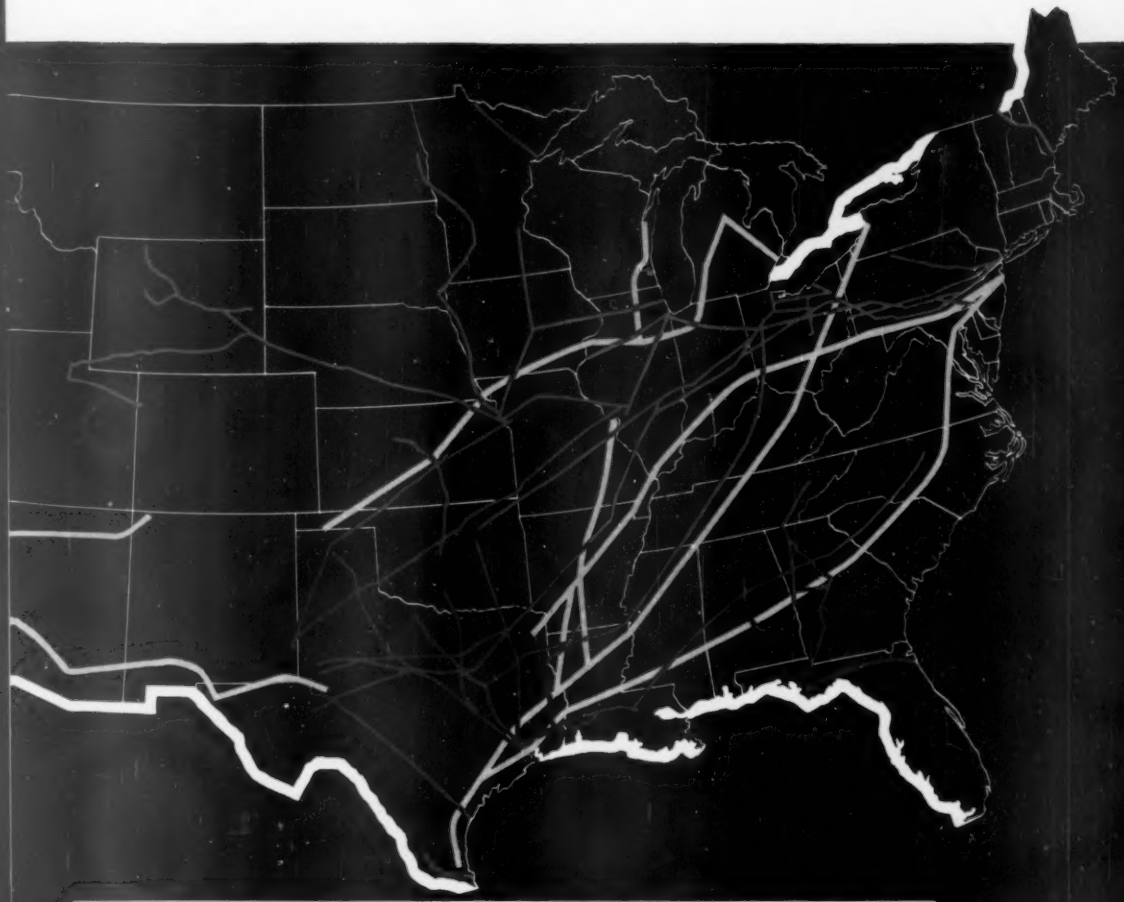
The experience gained in equipping these 34 lines is invaluable. Interest in remotely operated and automatic pumping stations is increasing and it's interesting to note that 20 years ago Westinghouse equipped the first pipeline pumping station for remote supervisory control. And Westinghouse Engineers are continually working on new developments to minimize the cost of pump station attendance. When your next job comes up, call Westinghouse early in the planning stage. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Penna. J-94883

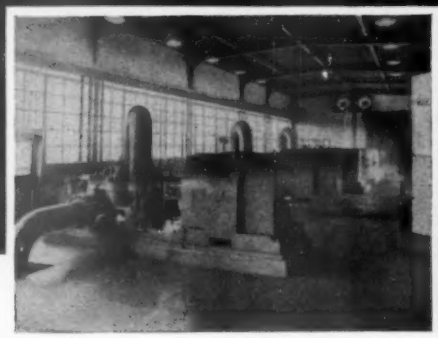

KEY
NATURAL GAS PIPELINES
CRUDE OIL AND PRODUCTS LINES
These 34 major pipelines equipped in whole or in part with Westinghouse equipment

YOU CAN BE SURE.. IF IT'S

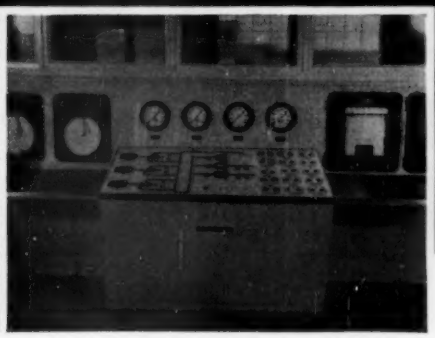
Westinghouse

EQUIPMENT FOR THE PETROLEUM INDUSTRY



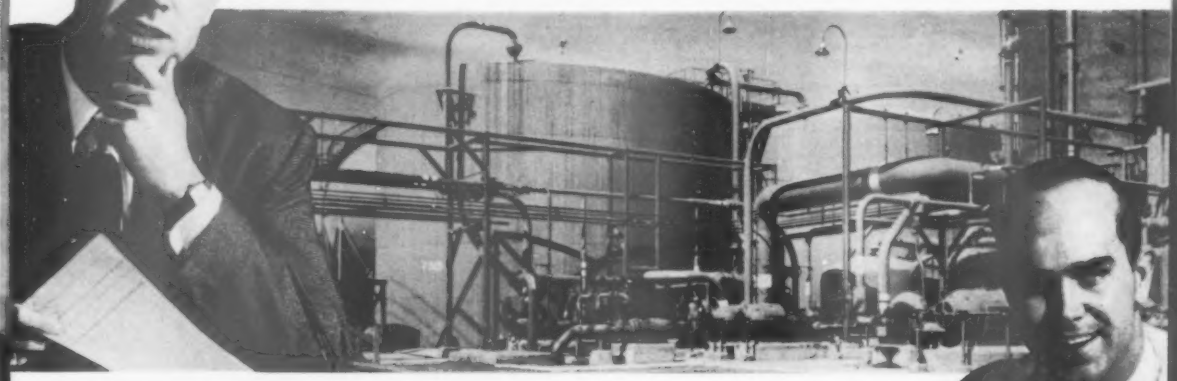


A group of 1,250-horsepower forced-ventilation motors installed in a pumping station of a large crude oil pipeline. All units, including the suction and discharge valves and the ventilation blowers, are remotely operated by a sequence control system.



Pressing buttons on this control desk starts the main pumps and operates valves. Indicating lights show valve position. Other lights identify the operation of protective devices which warn of abnormal conditions. Buttons at right control booster pumps.

When you're up against a tubing problem . . .



Tubing Headquarters

can help you solve it!

WHEN the question of tubing comes up for a new installation or for replacement, don't cross your fingers and "take a shot in the dark" hoping that your choice will prove the answer to your needs. Play safe! Come to Tubing Headquarters. Tell National Tube what conditions are at your plant. The chances are that we have already helped other refineries handle similar situations . . . *and successfully*. In fact our files are filled with case histories, the results of laboratory tests, and actual field observations involving National Seamless Steel Pipe and Tubing under practically every condition of temperature, pressure, corrosion and exposure.

Out of this research and study have come important developments in tubing steel which enable National Tube to offer you seamless steel tubing, condenser tubes, heat exchanger tubes, and refinery piping in *24 different analyses*. Each of these 24 different analyses has been performance-proved to meet the specific conditions of corrosion and oxidation for which it is recommended.

We invite you to bring your problems to National Tube. Our tubing specialists will work closely with your own engineers to see that you get *just the right* tubes and piping for your particular requirements.

NATIONAL TUBE offers you
Seamless Steel Still Tubes
Condenser Tubes
Heat Exchanger Tubes
Refinery Piping
in 24 DIFFERENT ANALYSES

Carbon	7 Cr, ½ Mo
Carbon, ½ Mo	8 Cr, ½ Mo
½ Cr, ½ Mo	8 Cr, 1 Mo
1 Cr, ½ Mo	9 Cr, 1 Mo
1¼ Cr, ½ Mo	12 Cr, Al
2 Cr, ½ Mo	17 Cr
2¼ Cr, 1 Mo	27 Cr
2½ Cr, ½ Mo, ¾ Si	18-8
3 Cr, 1 Mo	18-8 Ti
5 Cr, ½ Mo	18-8 Cb
5 Cr, ½ Mo, 1½ Si	18-8 Mo
5 Cr, ½ Mo, Ti	25-20

All National Seamless Tubes are pierced from a solid billet of high-quality steel. This is the one manufacturing method that removes all doubt concerning uniform wall strength.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S NATIONAL SEAMLESS PIPE AND TUBES

UNITED STATES STEEL

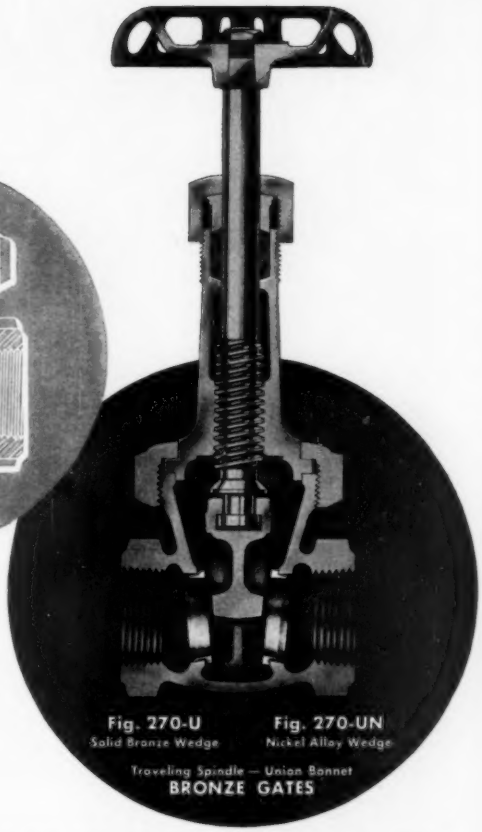
Built-in $AVING$

make

JENKINS BRONZE GATES

your

BEST BUY



Look over any of the 35 patterns in Jenkins complete line of Bronze Gates. You'll find *savings* built into every valve. Jenkins valve specialists designed each one for easy maintenance and extra long wear. Try them on your toughest services and see why they take top-rating in any test for endurance and economy. Jenkins Bros., 100 Park Ave., New York 17.

Jenkins Bronze Gate folder shows the many types available — lists convincing reasons why they are your **best buy** for any service. Ask for Form 181-A.

Typical of Jenkins design for built-in savings are the Fig. 270-U and Fig. 270-UN Gates for 200 lb. Steam, 400 lb. O.W.G. services.

MONEL AND BRONZE SEATING COMBINATION In Fig. 270-U a high quality bronze wedge seats against MONEL rings expanded in the body. The wedge takes the wear — it can easily be replaced when necessary by slipping a new one on the stem. Fig. 270-UN, with a nickel alloy wedge, is recommended for exceptionally severe conditions of rapid wear and corrosion.

These and other features of rugged construction make Figs. 270-U and 270-UN first choice for economy where conditions are most destructive to valves, as in oil refineries, dye houses, chemical, food, and rubber plants.

JENKINS VALVES

LOOK FOR THE DIAMOND MARK

SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS

Treated water used to cool transformers, busbars, bushings, and bushing terminals in the Gustin-Bacon Manufacturing Company's plant at Kansas City must be kept free of all foreign matter to insure uninterrupted around-the-clock operation.

Since the installation of these giant bronze fitted ELS Liquid Filters in the circulating cooling water system, down time due to cooling tube and orifice stoppage has been eliminated.

DOLLINGER PROTECTION STAYNEW FILTERS

DOLLINGER CORPORATION

5 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

SAFE

SURE

FAST

EASY

VALVE OPERATION

Get all 4 with LIMITORQUE

For remote or local control . . . positive, speedy, safe, dependable opening and closing of all types of valves up to 120" diameter . . . equip with Limitorque. *Just pushing a button sets them in operation.*

They provide complete safety in two ways: First, they protect the workmen by eliminating the need of climbing to high or hazardous locations for manual valve operation. Second, they protect the valve operating parts by assuring a tight valve closure without overload on disc, seating rings or valve stems . . . and by automatically shutting-off the motor if foreign obstructions are met during the closing cycle.

Limitorque is actuated by any available power source . . . electricity, air, water, gas or oil.

Your valve maker can supply Limitorque Controls.

For complete details about Limitorque, send for Catalog L-50.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY
313 WILSON, SO. NORWALK, CONN.

NOW . . . SUPAIRTHERMAL* SPARK-FIRED GAS ENGINES

*Trade mark

. . . another NORDBERG achievement for outstanding GAS FUEL ECONOMY in a WIDE RANGE of HORSEPOWER

Ten IMPORTANT FEATURES

1. *High thermal efficiency.*
2. *Proven ignition systems.*
3. *Same heavy-duty construction features as Nordberg 4-cycle Diesel engines.*
4. *Double the horsepower of naturally aspirated engines.*
5. *Smooth, uniform combustion.*
6. *Lower exhaust temperatures.*
7. *Convertible to Diesel or DUAFUEL® operation.*
8. *More horsepower hours per gallon of lubricating oil.*
9. *Wide range of horsepower.*
10. *Wide speed range.*

NORDBERG 4-cycle spark-fired gas engines, in sizes from 265 to 4260 H. P., now fill a long desired need for a highly efficient prime mover in industrial and municipal service. Increasing gas fuel costs have made *economy* the "watchword" of power plant operation. Nordberg *SUPAIRTHERMAL* spark-fired gas engines have a thermal efficiency in excess of 40 per cent as compared to 30 per cent or less in conventional non-supercharged engines.

Substantial savings in fuel costs and lower installation costs result through use of Nordberg gas engines. When capitalized over a period of years, they will more than pay for the original investment.

If you are looking for ways to cut power costs, get the full story on this latest Nordberg achievement . . . the result of sixty years' experience in the design and construction of prime movers and heavy machinery.

NORDBERG MFG. CO., Milwaukee, Wisconsin

For complete details about Nordberg Spark-Fired Gas Engines, write for a copy of the new BULLETIN 221.

NORDBERG

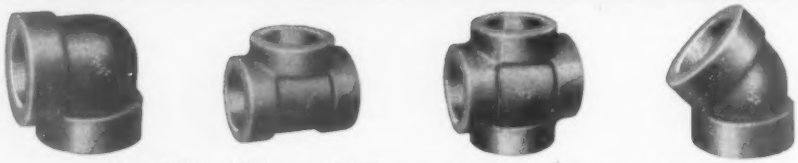
DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

Builders of America's Largest Line of Heavy-Duty Diesels

P253

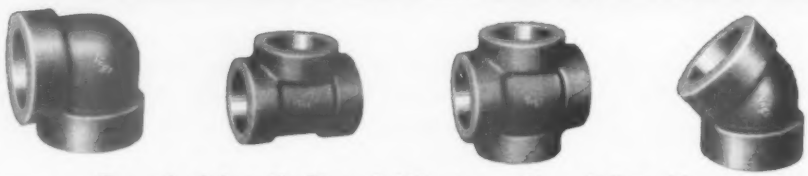
STRENGTH

for Safety and Long-Time Service



For 2000, 3000 and 6000 pounds service — Sizes 1/8" to 6"

SCREW END TYPE



For schedules 40, 80 and 160 pipe — Sizes 1/8" to 4"

SOCKET WELD TYPE

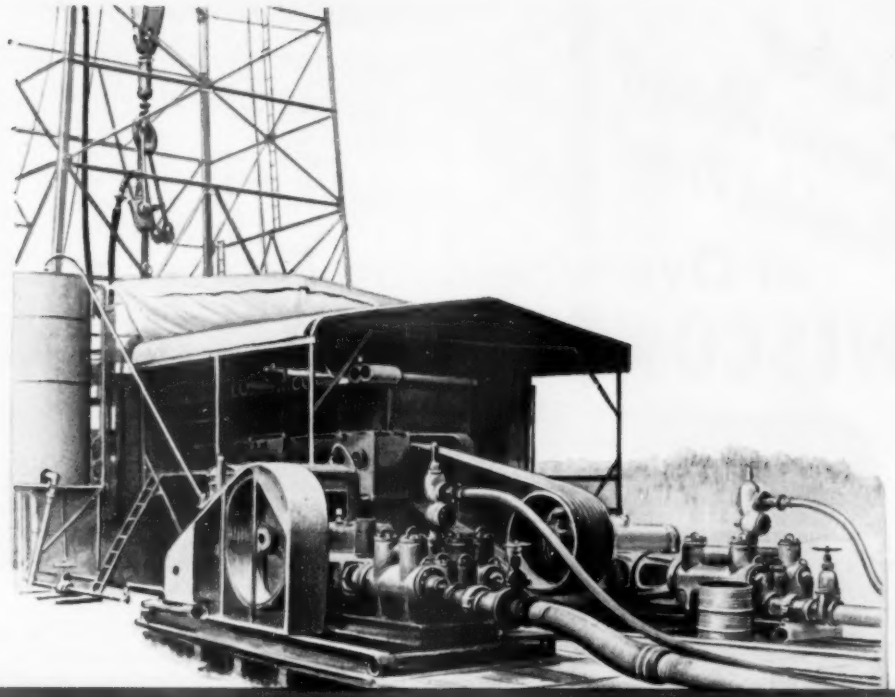
Vogt Ells, Tees, Crosses, etc., are forged from carbon steel or various alloys to meet specific operating conditions. Catalog F-9 will aid you in their selection and proper application.

Shocks and stresses imposed by high pressures and high temperatures are taken in their stride because Vogt fittings are uniform in structure, fine grained, and free from porosity . . . the superior product of laboratory controlled materials and giant forging hammers and upsetters. These properties also give higher resistance to erosive and corrosive conditions, thereby adding to service life expectancy in steam plants, petroleum refineries, chemical plants and related industries.

HENRY VOGT MACHINE CO., INC.
Louisville 10, Kentucky
BRANCH OFFICES: NEW YORK • PHILADELPHIA • CLEVELAND • CHICAGO • DALLAS

Vogt

DROP FORGED STEEL FITTINGS



Thermoid Multi-V-Belts

built to do the job in heavy duty oil field service

Men responsible for oil field equipment will tell you they get maximum wearing quality and top performance from Thermoid Multi-V Belts. On rigs, compressors and pumps, these belts give the kind of service required for most economical operation. One of the reasons for this is Thermoid's first hand knowledge of oil field requirements.

Thermoid V-Belts are pre-stretched to absorb repeated shocks; will withstand moisture and abrasion; provide maximum strength and flexibility.

When you want V-Belts to harness your horsepower more efficiently—do the job better—provide that extra margin of endurance that reduces costs—get Thermoid Multi-V Belts. Available singly or in matched sets from your distributor.

Mid-Continent Office and Warehouse: Houston, Texas
California Office and Warehouse: Los Angeles

SEE OUR CATALOG IN THE COMPOSITE CATALOG

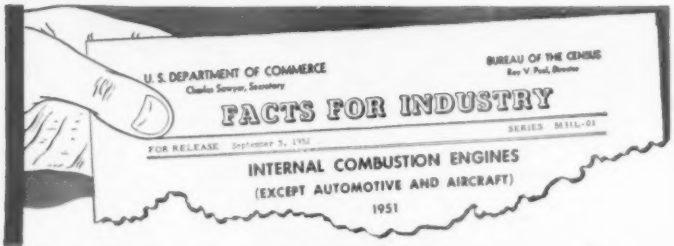
Powerflex Rotary Hose • Trioflex Slim-Hole Rotary Hose • Mud-Flo Slush Pump Hose • Flexible Discharge Units • F.H.P. and Multiple V-Belts • Oil Country Flat Belting

Thermoid

Wire Line Turn Backs • No-Wip Line Savers • Stuffing Box Rings • All Types of Hose • Molded Specialties • Brake Blocks

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

Latest Census Report Provides Proof


U. S. DEPARTMENT OF COMMERCE
Charles Sawyer, Secretary

BUREAU OF THE CENSUS
Roy V. Peel, Director

FACTS FOR INDUSTRY

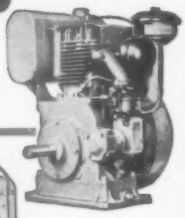
FOR RELEASE September 5, 1952 — SERIES M14L-01

INTERNAL COMBUSTION ENGINES
(EXCEPT AUTOMOTIVE AND AIRCRAFT)
1951

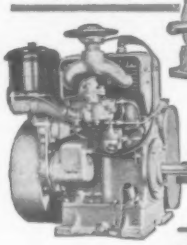
# of Overwhelming Preference for WISCONSIN HEAVY-DUTY *Air-Cooled* ENGINES

50.61% of Aggregate Total, 3 to 40 H. P. Engines made in 1950-'51 were WISCONSINS

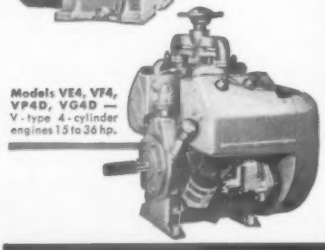
Models ABN, AKN, AEN Single cylinder engines 3 to 8½ hp.



Models AFH, AGH, AHH — single cylinder engines 6 to 9 hp.



Models TE and TF 2-cylinder engines 7 to 14½ hp.



Models VE4, VF4, VP4D, VG4D — V-type 4-cylinder engines 15 to 36 hp.

It is no idle boast when Wisconsin Motor Corporation is referred to as "No. 1 Source" for Heavy-Duty Air-Cooled Engines. Overwhelming verification of this statement is established through statistics presented in a Bureau of the Census report, released on Sept. 5, 1952, covering the production of all types of internal combustion engines (except aircraft and automotive).

Based on figures contained in this report, 50.61% (1950-'51 average) of all engines produced within an 11 to 175 cu. in. displ. range (approx. 3 to 40 hp.) were Wisconsin Air-Cooled Engines, exclusive of outboard marine and so-called "captive" engines built by various manufacturers for use on their own original equipment.

Here is positive *proof of preference* for Wisconsin Air-Cooled Engines by builders and users of power-operated equipment in all fields where dependable, heavy-duty engine service is required. These engines have been *pre-judged* and *pre-selected* by more power-wise purchasers than all other makes of engines combined, within their power range!

This universal preference is based on such factors as ideal adaptability of Wisconsin Engines to fit both the machine and the job; easy starting and trouble-free air-cooling under all weather and climatic conditions; low-cost maintenance; ready availability of factory-trained servicing and original replacement parts . . . plus *outstanding performance.*

It will pay you to specify "Wisconsin Power" for your equipment. Complete descriptive and engineering data on request.

WISCONSIN MOTOR Corporation
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

WRITE TO HARLEY SALES CO.
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505 SOUTH MAIN ST., WICHITA, KANSAS
OIL FIELD DISTRIBUTORS FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS.

Hook-ups like these with Guyton Routing Valves save time and reduce waste. The valves automatically close when a tank is full, thus routing the flow to the next tank in the battery. The stand-by time for the pumper is eliminated. You can get full information on the Guyton Routing Valve by writing directly to Murdock Tank & Mfg. Co., Tulsa, Oklahoma.

These routing valves save you money ...on stock tank hook-ups

With Guyton Routing Valves you can save the unnecessary time and expensive car mileage normally involved in manually operating tank batteries on widely scattered leases.

Once the valves are set on the battery of tanks, the Guyton Valve automatically controls the flow of the oil from the well to the storage tanks. As each tank is filled, the valve closes and the oil is routed to the next tank.

When the last tank is filled the line is automatically closed. The only manual attention required is the resetting of the valves. Any tank can be by-passed by simply not setting the valve on that tank.

In addition to the savings in time and mileage, the Guyton Valve reduces waste and eliminates the fire hazard of overflowing tanks.

Monel used to meet severe conditions — The manufacturers of the Guyton Valve wanted a metal that would stand up against the destructive attacks of hydrogen sulfide, brine and entrained solids.

That's why they chose Monel for the working parts — for stems, valve seats, springs, washer bushings, and float assembly blocks and float arms. Monel offers protection against the severest oil field conditions because it combines high strength and toughness with an exceptional degree of resistance to corrosion, abrasion and wear.

Consult your distributor of Inco Nickel Alloys for the latest information on their availability from warehouse and mill. Remember, too — it always helps to anticipate your requirements well in advance.

And any time you run into problems involving metals for oil field use, we hope you'll write us. Inco's Technical Service and Corrosive Engineering Section may already have the answer handy. If not, they may be able to help you find it. Either way, there's no charge or obligation.

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OILFIELD POWER

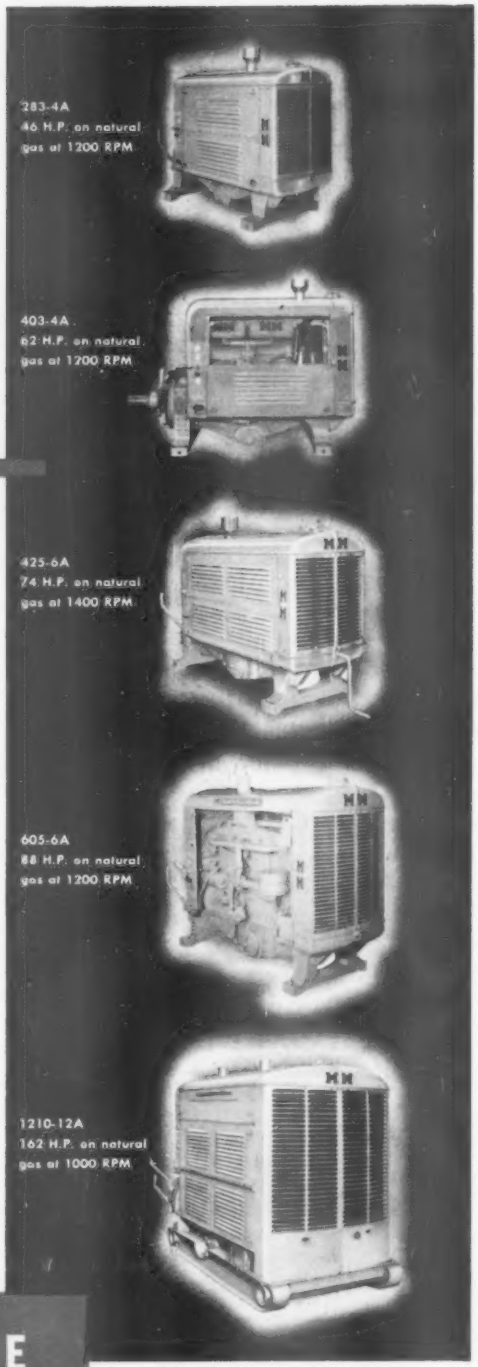
POWER UNIT

to fit every oilfield job!

*R*ugged parts design that gives you *longer* engine life, continuous performance . . . slow-speed operation with a *reserve* of *work-power*—these are the things you get with MM Power Units. *But that's not the whole story!* MM owners and users will tell you that MM Power Units are *quality* engineered to deliver *low-cost* power.

These advantages have helped to build MM's enviable reputation: Accurately controlled cooling of the high-turbulence combustion chambers; positive lubrication and water jacketted base pan that maintains constant oil temperature to prevent formation of engine-wearing sludge; metered vacuum crankcase ventilation; automatic cut-out on cooling and lubricating systems. These features have helped, but what is more important are the materials and workmanship of construction, the fine tolerances, the larger bearing surfaces . . . briefly put, it's the *integrity* that's built into MM!

Your dollars can purchase no more. Can you afford to invest in less?


283-4A
46 H.P. on natural gas at 1200 RPM
403-4A
62 H.P. on natural gas at 1200 RPM
425-6A
74 H.P. on natural gas at 1400 RPM
605-6A
88 H.P. on natural gas at 1200 RPM
1210-12A
162 H.P. on natural gas at 1000 RPM

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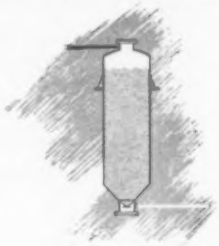

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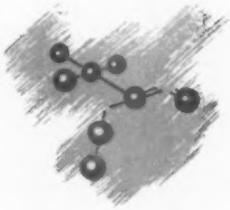
Attapulgus or Porocel sorptive minerals are recognized standards in desulfurization, reforming and isomerization systems—catalytic removal of unsaturates—conversion of sulfides to elemental sulfur—fluid catalyst applications—as catalyst carrier in copper sweetening processes.



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We offer a wide range of reliable, thoroughly proved desiccants for drying air, hydrogen, carbon dioxide, hydrocarbon liquids and gases.

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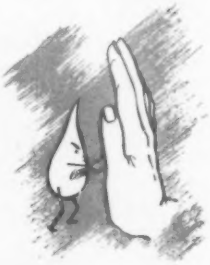
Mine and plant facilities permit prompt and economical production of grades meeting individual customer specifications. Our laboratories and technical staffs welcome the opportunity of assisting in research, development, design and operating problems. Your inquiries are invited.



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The pre-tested toughness of Atlas Roller Chain lets it take a beating, stand up longer. That means lower maintenance and fewer replacements, greater production and higher profits.

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ATLAS

ATLAS ROLLER CHAIN

Ayres' New Aerial Machine, circa 1887 invented by Dr. W. O. Ayres of New Haven, Conn.

by courtesy of Kaan Archives

PIPE WITH THE YEARMARK

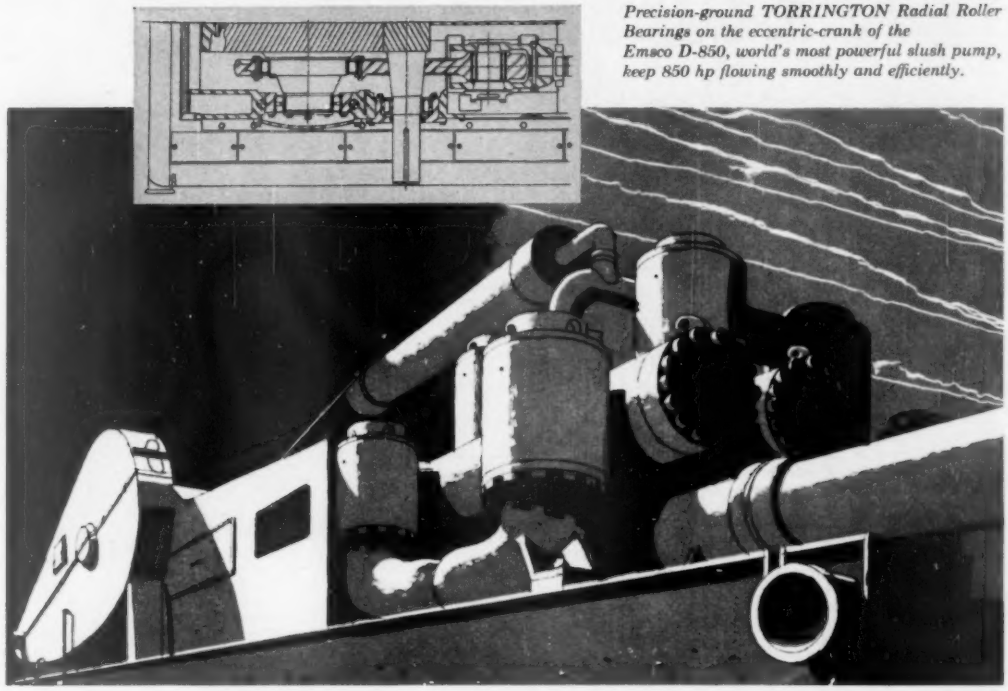
IMPORTANT DATES IN HISTORY

Way back in 1887, people were still using steel pipe for every conceivable need. Today, in 1953, steel pipe continues to find its way into American home life and form a strong background for American industry. Whatever the year may be, when the steel is welded into a length of Wheatland's "pipe with the yearmark", it is always a sign and a mark of endurance.

WHEATLAND TUBE COMPANY

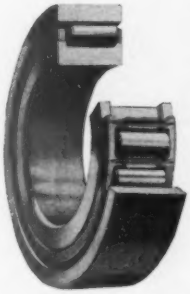
BANKERS SECURITIES BUILDING, PHILADELPHIA 7, PA

Scrap is urgently needed to help keep America strong and free. Do your part — *get in your scrap today!*



Precision-ground TORRINGTON Radial Roller Bearings on the eccentric-crank of the Emsco D-850, world's most powerful slush pump, keep 850 hp flowing smoothly and efficiently.

Specified for the world's most powerful slush pump!



Bearings for the eccentric-crank of the world's most powerful slush pump—the 850 hp Emsco D-850—must be built to take a beating.

That's why Emsco specified TORRINGTON Radial Roller Bearings.

TORRINGTON Radial Roller Bearings are specially designed to cut friction under high radial loads. Their cast-bronze cages are *land-riding*. Their contact surfaces are *precision-ground*.

Results: free flowing power, longer bearing life.

Also specified were self-aligning TORRINGTON Spherical Roller Bearings for the main shaft and rugged, compact NCS Needle Bearings for the crosshead. Thus maximum operating efficiency and minimum operating costs were doubly assured.

Specify TORRINGTON Bearings for your own pumps—and for all your other oil-field equipment. There's a precision-ground TORRINGTON Bearing for every application.

THE TORRINGTON COMPANY
South Bend 21, Ind. Torrington, Conn.

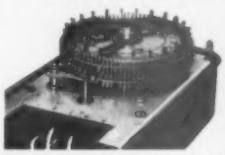
TORRINGTON RADIAL ROLLER BEARINGS

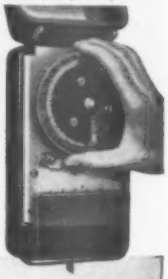
Spherical Roller • Needle • Tapered Roller • Straight Roller • Ball • Needle Rollers

THIS IS "Oil Country" CONTROL

Built the way oil men told us to build it

Cutler-Hammer 9589 oil well pumping controller with 3 coil overloads and time delay relay.





Program Time Switch automatically schedules pumping, set up easily by pull tabs—one for each 15 minute interval. Day omission feature also available, for non-operation any selected days of week.

You know and we know that there are no operating conditions anywhere as tough and rough as oil country conditions. And that is why Cutler-Hammer Engineers went to the oil country when they designed their oil well pumping control, talking to operators, production men, maintenance crews, getting the story on the spot.

To beat the heat, C-H engineers made the case finish of sun reflecting aluminum, built in louvres at the top and bottom to drain off the heat at the top and bring in fresh air at the bottom. The contact structure is out in the open where heat radiates freely. You never see a C-H Controller with door propped open to keep it working.

To beat the dust, and dirt, and insects and rain, they not only louvred but bronze-screened and baffled the ventilator openings; they used the famous C-H dust safe Vertical Contacts that shed dust; they neoprene-gasketed the timer mechanism and provided an excess torque clock motor that keeps going even if dust accidentally gets in.

They provided 2 coil overload relays where conditions are normal, and 3 coil overload relays where single phasing is a common occurrence.

They provided undervoltage relays where manual restarting is desirable, and automatic time delay relays where automatic staggered restarting is wanted. The mounting arrangements are universal so you can easily change from one to another. Or you can short out the staggered starting for instantaneous automatic restarting.

You can change the on-off sequence simply by pulling out small, accessible tabs in 15 minute increments. You can have an automatic day omission feature if you want it.

Other features are unit lightning arresters that tell at a glance if one is blown—but *won't* blow up the works with it. There's a plastic coated wiring diagram with spare parts listing, that doesn't become smudged and unreadable from greasy handling.

These oil well pumping controllers are used everywhere, proved everywhere, preferred everywhere. Try one and *see why*. CUTLER-HAMMER, Inc., 1453 St. Paul Ave., Milwaukee 1, Wisconsin. *Associate*. Canadian Cutler-Hammer, Ltd., Toronto.

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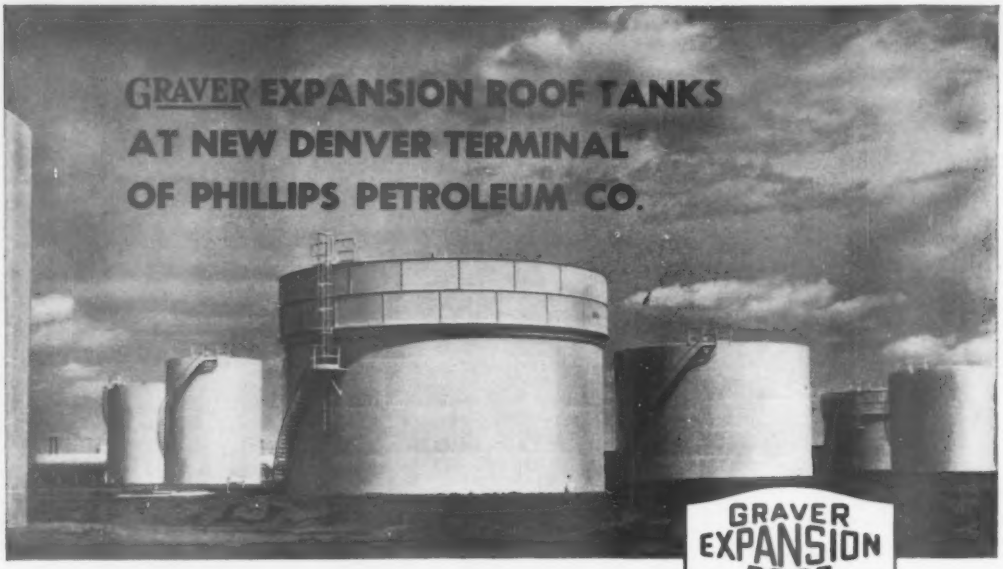

16 Graver Tanks comprise Terminus of new Phillips Pipeline

Graver supplied all the field-erected tankage for the Phillips Petroleum Company at its recently completed products pipeline terminal at Denver. The final step in a new 355 mile pipeline from the Texas Panhandle to the Rocky Mountain area, the terminal is equipped to handle the storage and distribution of such products as gasoline, aviation gasoline, L.P.G., kerosene and diesel fuels. The terminal receives approximately 5,000 bbls. of petroleum products each day.

A total of 16 Graver tanks are in service at the installation and have a total capacity in excess of 140,000 bbls. Conspicuous in this tankage are two 20,000 bbl. Graver Expansion Roof tanks, each equipped with a 10′ lift. Manifolded to these 60′ and 40′ tanks are a number of cone roof tanks, forming closed vapor systems. As the vapors from the volatile products stored within these cone roof tanks expand with increases in temperature, they travel through the vapor lines to the Expansion Roof tanks and the roofs rise to accommodate them. As the temperature drops, the vapors travel back to the cone roof tanks and the Expansion Roofs descend. As a result of the automatic action, all breathing losses are eliminated and filling losses minimized.

Thus, Graver Expansion Roof tanks are providing the key to the purpose of this new terminal—the delivery of a dependable year-round supply of refinery-fresh petroleum products to Phillips' customers throughout the Denver area.

GRAVER TANK & MFG. CO., INC.
EAST CHICAGO, INDIANA
NEW YORK • CHICAGO • PHILADELPHIA • WASHINGTON
DETROIT • CLEVELAND • PITTSBURGH • CASPER, WYO.
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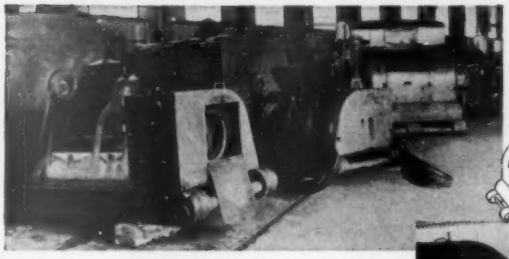
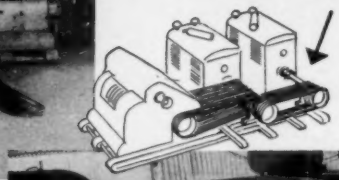
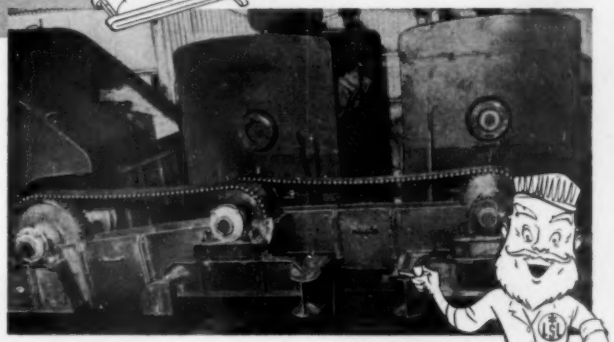
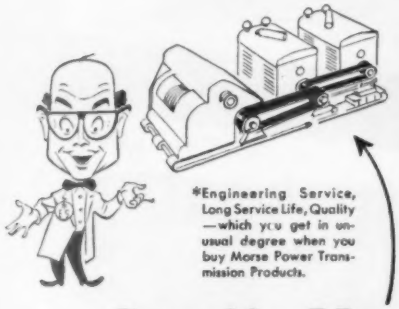
Reduce moving day costs!



1. This rig with compound Diesel engine and drawworks had to be built in three parts because of huge bulk of V-belt drives. Assembly, disassembly and "trueing up" wasted time, money. Also, drive tension needed when drilling below 8000 feet caused bearing failures seven times in one year.







*Engineering Service, Long Service Life, Quality —which you get in unusual degree when you buy Morse Power Transmission Products.

2. Here is the same drawworks converted to HY-VO Drive. A slim 1½" pitch x 3" wide HY-VO Chain compounds the 175 hp Diesels, and 1½" pitch x 6" wide HY-VO Chain drives the drawworks at 900 rpm and 3600 fpm. Compact, lightweight HY-VO saved so much bulk that the drawworks could be built as a single unit, easily hauled on one truck. Too, extra capacity of HY-VO allows deep drilling *with no undue strain* on bearings.

Specify Morse HY-VO drives for new rigs or conversions

In the before-and-after story above, you see a dramatic example of how Morse HY-VO Drive can reduce moving day costs in your oil patch.

What's more, HY-VO practically eliminates rig-smashing vibrations common to conventional chain drives, flows belt-smooth power to your equipment by means of tough steel. Too, HY-VO sharply reduces downtime, vastly increases service life.

Check these HY-VO Drive facts

1. Transmits up to 5000 hp in single-drive units.
2. Transmits more horsepower per inch of width, saves weight.
3. Cuts cost per operating hour by as much as 50%.
4. Operates quietly at velocities over a mile a minute.
5. Smooth as a gear with less than 1% friction loss.
6. Offers up to ½ longer service life.

For complete facts on HY-VO Drive and other Morse products—Morflex Couplings, Morflex Radial Couplings and Morse Roller Chains—check your local supplier or Morse representative.

M=PT
Morse *means* Power Transmission

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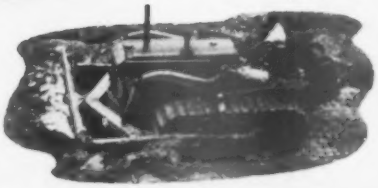
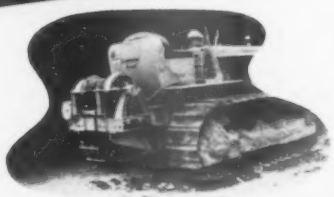


HOLLAND

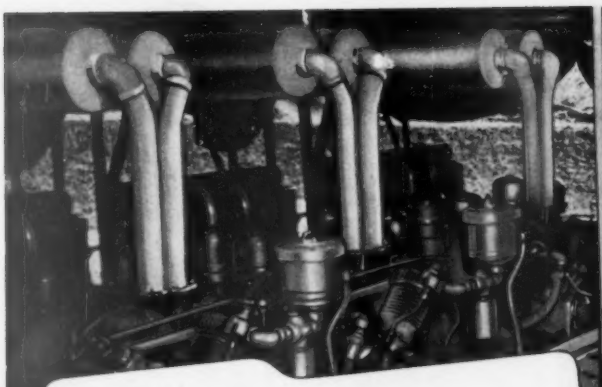


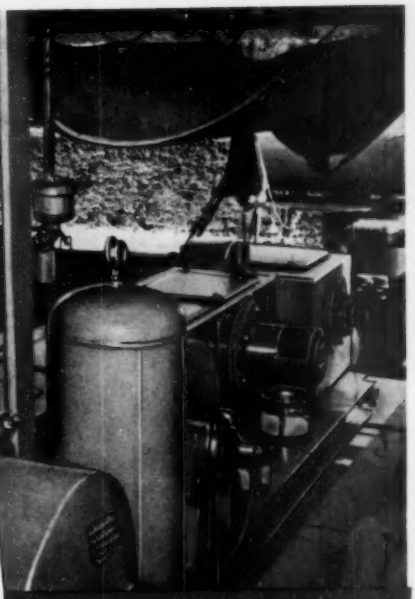
SWEDEN

Tulsa* Winch

TULSA, OKLAHOMA

DIVISION OF VICKERS Inc.





GM DIESEL
CASE HISTORY NO. 5211-85

USER: Trant Drilling Co., Tyler, Texas

INSTALLATION: Four GM Diesel Twin-6 units: three driving Ideco PRC-800 rig and 18" Oilwell pump; fourth Twin-6, with torque converter, drives 14" pump on standby.

PERFORMANCE: Owner Sam Trant reports: "These GM Diesels have operated 14,000 hours and the first overhaul seems to be many hours away. We've had no down time and preventive maintenance costs have been unusually low. They're the most satisfactory engines I ever used."

WORKED 14,000 HOURS

with no down time

GM
DIESEL
POWER

Vital Contact

IN PIPELINE COMMUNICATIONS

MOTOROLA 2-WAY RADIO SYSTEMS

maintain instant contact with repair crews, supervisory personnel and emergency operations

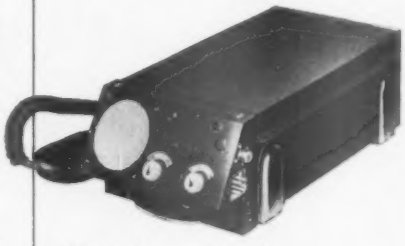
In any hard-slugging operation that requires fast, accurate timing of all crews and equipment, look to Motorola 2-way radio as step one in promoting efficiency, economy, and new operational profit!

As an investment, too, Motorola puts first emphasis on your *profit interest*. The equipment is Motorola-engineered throughout to give you the biggest dollar's worth of top performance at the lowest maintenance cost on record. It also gives you the *protected* value of obsolescence-proof equipment.

Motorola®
Communications & Electronics, Inc.
A SUBSIDIARY OF MOTOROLA INC.
900 N. Kilbourn Ave., Chicago 51, Illinois
Rogers-Majestic Electronics Ltd., Toronto, Canada

UNI-CHANNEL

Portable Base Station Radio



Quickly set up anywhere for mobile or fixed station use, this unit delivers instant, dependable radio communication year after year. Optional power supply permits use of either 117 V, A.C. or 6 V, D.C. . . . just plug it in, connect antenna and go to work!

Permanently Tuned
PERMAKAY FILTER

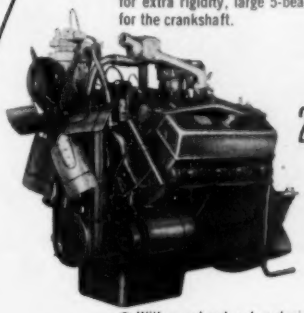
This unique Sensicon Permakay filter, an exclusive Motorola development, gives you sealed selectivity which permanently eliminates costly tuning adjustments.

You need a new set of rules to judge this AUTOCAR

The time has come to throw away the book and judge heavy-duty truck engines by a different set of standards. You won't find anything to compare with this modern valve-in-head V/8 engine. It has all kinds of power—200 plus hp—and the quick, sure response only the V/8 design gives. It has built-in smoothness of operation, quick pick-up, and good road speeds.

Smart buyers will appreciate these four typical examples of the modern design that went into every part of the engine:

- Weight-power ratio lowest of all comparable truck engines—about 6 lbs. per hp.
- Boxlike V/8 construction of engine block for extra rigidity, large 5-bearing support for the crankshaft.



200 HP

- With overhead valve design, you can easily reach the points that require maintenance—downtime and shop labor costs are reduced.
- Wet cylinder sleeves, a major contribution to low maintenance costs, can be replaced at a fraction of the cost of reboring the block.

You'll want to know more about this sensational valve-in-head V/8 engine. Fill out the coupon below for this informative booklet.

AUTOCAR TRUCKS

The Autocar Company, Ardmore, Pa.

Established 1897

Factory Branches and Dealers from Coast to Coast

The Autocar Company, Ardmore, Pa.

Please send me the Autocar V/8 booklet.

Name_____ Title_____

Company_____

Street_____

City_____ Zone____ State_____

Number of trucks in fleet_____

19A

LOADING — High reverse speeds and power-boosted steering make these "PAYLOADERS" big producers on loading work . . . have dumping height to load big trucks.

DIGGING — Sump pits, drilling sites and other grading and excavating tasks are regular assignments for 4-wheel-drive "PAYLOADERS" . . . are driven quickly to the job.

BACKFILLING — The regular bucket is widely used for fast backfilling work, but this blade attachment is also available.

CARRYING — This Crane Hook is one of several attachments that greatly multiply "PAYLOADER" usefulness.

MASTER OF MANY JOBS

Big 4-wheel-drive "PAYLOADERS" are proving their value and versatility in the oil industry as they have in so many others. They're multi-purpose handymen for the pipe liner, the driller and refiner . . . can excavate, load trucks and backfill trenches . . . build fire walls, grade and spread . . . pull, push, lift and carry. These outstanding tractor-shovels have four speeds in reverse as well as forward, ranging from a powerful 2 M.P.H. crawl up to 27 M.P.H. transport speed.

They've got power-boosted steering . . . full hydraulic fingertip bucket control . . . automatic tip-back bucket motion . . . unsurpassed operator visibility. And there's a choice of gasoline or diesel power up to 90 H.P. Once you've seen a "PAYLOADER" in action, you'll realize what they can do on *your* jobs. See your "PAYLOADER" Distributor today or write The Frank G. Hough Co., 749 Sunnyside Ave., Libertyville, Illinois.

WRITE for full information on any of the "PAYLOADER" models: FourWheel Drive HM — 1½ yd. and HR — 1 yd.; Rear Wheel Drive Models HY — 1¼ yd., HF — ¾ yd., HE — ½ yd.; Front wheel drive Models HAH — 15 cu. ft., HA — 12 cu. ft.

PAYLOADER®

Tenamene 1
Tenamene 2

most effective gum inhibitors known

Tenamene gum inhibitors have set the standards of the industry for over 15 years. No known inhibitors are more effective in preventing gum formation.

They're economical too. For example, as little as 5 pounds of Tenamene 1 may be needed to treat 1000 barrels of gasoline—at a cost of approximately 2½¢ per barrel.

The use of Tenamene 2 results in an extra dividend for refiners. It can be used as a combination sweetening and inhibiting agent to save time, materials and equipment.

Send for the Tenamene booklets listed in the coupon. They contain interesting general information about gum inhibiting and sweetening as well as specific data about the Tenamenes. Our Petroleum Chemicals Laboratory will be glad to make tests and recommendations on any of your inhibiting or sweetening problems.

SALES REPRESENTATIVES: Eastman Chemical Products, Inc., Kingsport, Tennessee; New York—260 Madison Ave.; Framingham, Mass.—7 Hollis St.; Cleveland—Terminal Tower Bldg.; Chicago—360 N. Michigan Ave.; St. Louis—Continental Bldg.; Houston—412 Main St. **WEST COAST: Wilson Meyer Co.,** San Francisco—333 Montgomery St.; Los Angeles—4800 District Blvd.; Portland—520 S. W. Sixth Ave; Seattle—821 Second Ave.

Tenamene EASTMAN GASOLINE ADDITIVES

Eastman
CHEMICAL PRODUCTS, INC.

Eastman Chemical Products, Inc., Chemical Sales Division, Kingsport, Tenn.

Gentlemen: Send me copies of your booklets: "Inhibiting Motor Fuels with the Tenamenes" and "Tenamene 2 Inhibitor Sweetening."

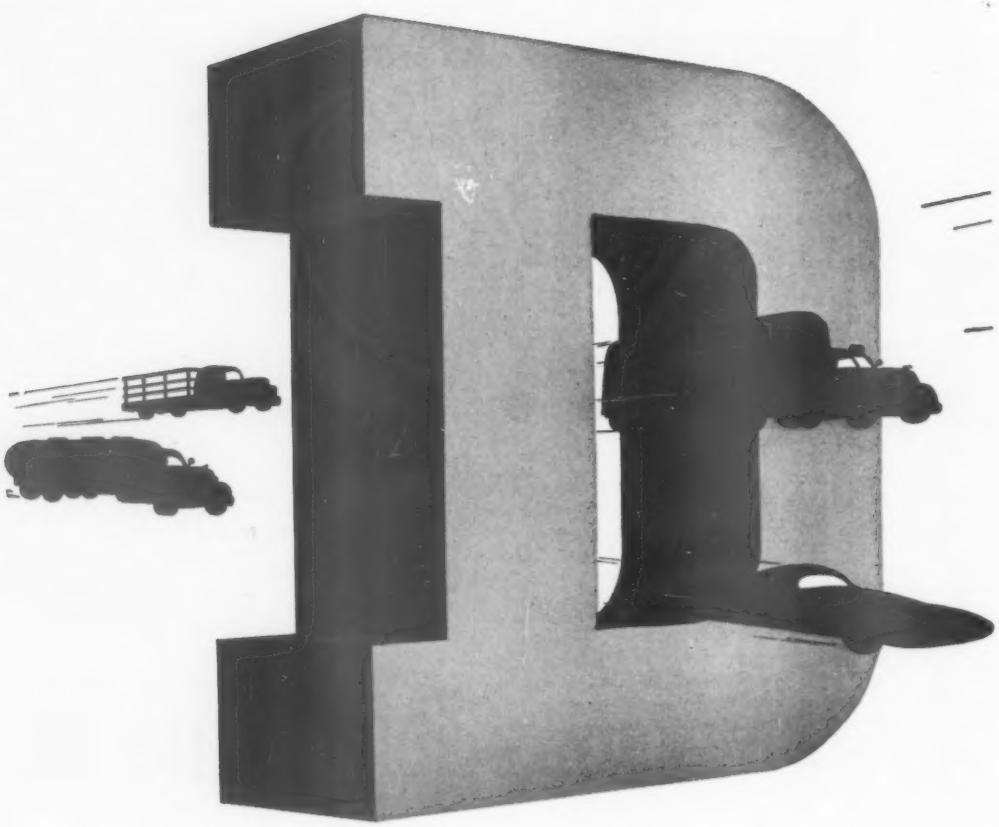
NAME & TITLE .....

COMPANY .....

STREET .....

CITY & STATE .....

Sales Representative for **TENNESSEE EASTMAN COMPANY,** Kingsport, Tennessee, division of **EASTMAN KODAK COMPANY.**



DAVISON DEPENDABLE CATALYSTS BUILD BETTER MOTOR FUEL

The operating efficiency of synthetic fluid-type cracking catalysts is important. This operating efficiency can be assured by uniformity of physical characteristics and chemical purity. Davison's production of microspheroidal (M-S*) is tops in uniformity . . . providing all users with a highly efficient synthetic fluid-type cracking catalyst. Your requirements can also be supplied in ground (DA-1*) form. Write for further descriptive information. Experienced Davison Field Service Engineers backed up with complete laboratory testing facilities are part of Davison's service.

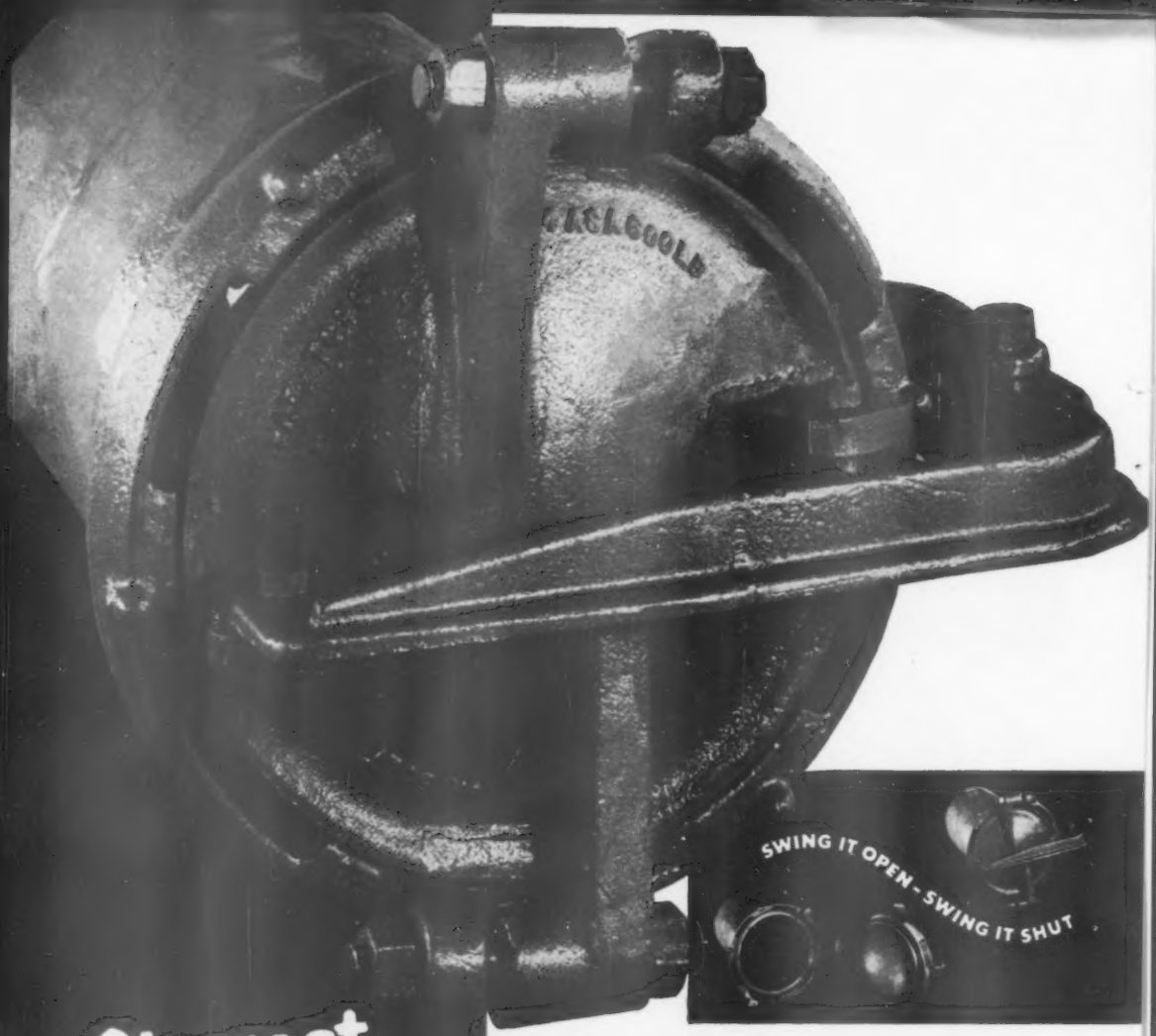
*T.M.T.D.C.C.

Progress Through Chemistry

THE DAVISON CHEMICAL CORPORATION

Baltimore 3, Maryland

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS, SILICOFLUORIDES AND FERTILIZERS



Biggest "Discovery" in Years

The UNIBOLT Hinged Scraper Trap with self-sealing gasket swings open and shut like a door by simply releasing two bolts. No heavy lifting . . . nothing to fall on workmen . . . no leaks . . . no time-consuming multi-bolt flanged closures. Installed on an oversize barrel, it's no job at all to get a pig in or out of this trap.

These simple, convenient closures are equally desirable for gas line blowdowns, strainers, terminal manifolds, or any other service where pressure vessels must be opened for inspection, cleaning, repairing, connecting to a line, etc.

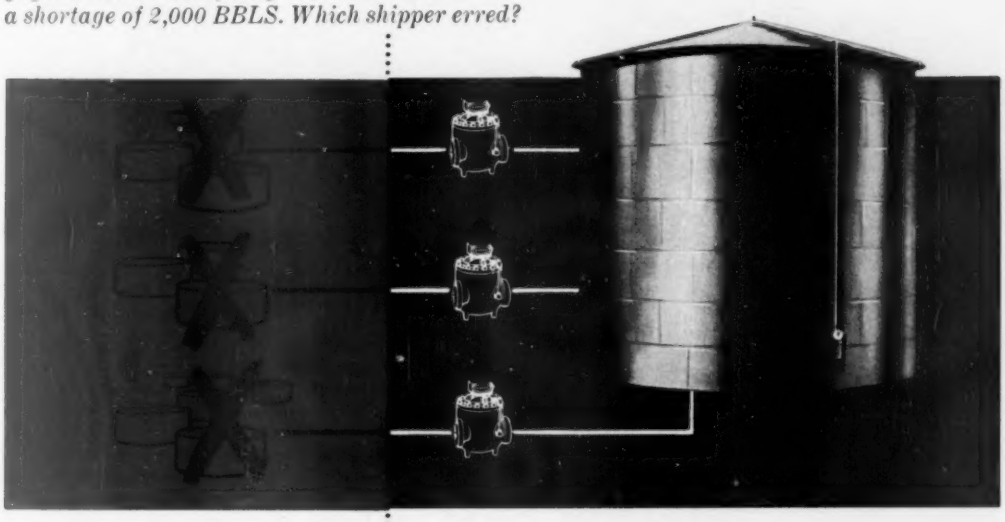
Bulletin PL-*510* will gladly be sent on request.

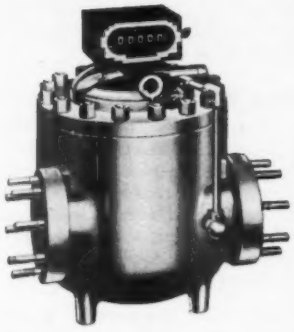
THORNHILL - CRAVER COMPANY

P. O. BOX 1184 HOUSTON, TEXAS

this could happen to you...

Three shippers claim to have pumped 10,000 BBLS. of crude each—yet the receiving tank gage shows a total of only 28,000 BBLS.— a shortage of 2,000 BBLS. Which shipper erred?





valve *of the SMITHway Sliding Vane Rotary Principle has especially proven itself in the measurement of crude. SMITHway Meters handle millions of bbls. of crude and distillate accurately before requiring service. Servicing is simple — construction allows entire measuring unit to be removed, repaired or replaced without breaking flange connections.*

When receiving from one or more sources into common storage, as is being done more and more today, SMITHway Meters on each stream will show which delivery was deficient and proper adjustment can be made. By registering actual receipts, they pay for themselves in a short time and they keep on protecting your interests for years to come.

In addition to this basic service, they offer other important advantages. Fewer storage tanks are required for measurement purposes thus reducing real estate, capital investment and maintenance expense. Less oil is held in idle inventory. For the complete story, send for Bulletin No. 126-A.

78th ANNIVERSARY 1874 1952

A.O.Smith

METER DIVISION

FACTORIES: 5715 SMITHway STREET • LOS ANGELES 22, CALIF. • P.O.BOX 500, SUCCASUNNA, N.J.

Offices: New York 36, Chicago 7, Houston 20—Canada: Toronto 12, Vancouver 1
International Division: Milwaukee 1, Wisconsin

15 Lorains Beat New England Rock!

70% ROCK ON 108 MILE PIPELINE

Lorain Pipeliner, Model 50-K, on the Bechtel-Lombardy Joint Venture for Tennessee Gas and Transmission Co., from Port Chester, New York, to Agawam, Mass.

Lorain Clamshell, Model TL-25, handles special excavation on the same job.

▶▶ This job consisted of 108 miles of 16" mainline pipe, running from Port Chester, New York, to a point just over the Massachusetts line, plus 126 miles of lateral lines. The Bechtel-Lombardy Joint Venture of San Francisco handled the contract for the Tennessee Gas and Transmission Company. 11 Lorain TL-25's and 4 Lorain-50's led the attack on the mainline. About 70% of the total job involved rock, which first had to be blasted before hoes and clamshells could be used. About 85% of all ditch was handled by hoes. Most of the line was through mountainous areas and swamp land. Rugged, yes! But Lorain Pipeliners are built for that kind of duty.

59 LORAINS

Bechtel Corporation put plenty of faith in Lorain performance. To date, they have purchased the impressive total of 59 Lorains of all types . . . proof positive that Lorain performance has paid off under every condition on rugged pipeline work.

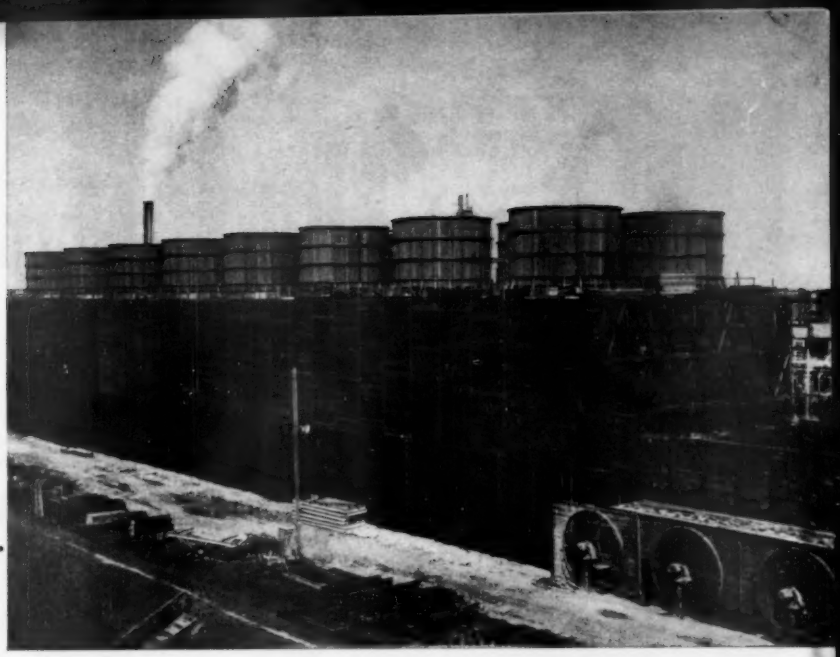
Lorain Pipeliners Have What Pipelines Take . . .

For your spread, investigate the reason why Lorain Pipeliners lead the field. Extra-long, extra-wide crawlers straddle trenches with ease, speed pipeline digging. Special-built dippers give clean vertical cuts. And there are sizes, front ends and other mountings that answer every specialized need. Thew-LorainDistributors across the nation have all the facts and figures.

THE THEW SHOVEL CO., LORAIN, OHIO

THEW LORAIN®

PIPELINERS



View, showing 16 cells of new Foster Wheeler cooling tower erected on foundation of old tower. Portion of old tower, shown at right, was replaced by 8 cells of new tower.

Tailored to fit customer plant conditions!

THE ERECTION of this new 24-cell cooling tower on the same foundation as the 56-cell tower which required replacement, without interruption in cooling capacity, is another example of the ability of Foster Wheeler to tailor the job to conditions in the customer's plant.

To assure a continuous supply of cooling water while the new tower was being built, 30 cells of the old tower were razed and the remaining 26 cells connected to two smaller existing towers by a temporary flume. The first 16 cells of the new tower were then erected and put into operation in time to meet the oncoming summer heat load. The remainder of the old tower was then removed and the balance of eight new cells erected.

It is through such unusual types of installations that Foster Wheeler has gained the reputation for engineering and construction excellence.

FEATURES OF THIS INSTALLATION:

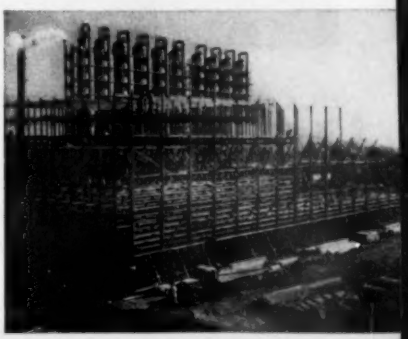
Combination cast iron and red brass distribution system, with 720 special full coverage red brass up-spray nozzles, provides uniform water distribution over a wide variation in water flow rates. Induced-draft fans with 16-foot stacks discharge tower vapors at a high velocity 60 ft. above basin curb—reducing recirculation to a minimum.

The new tower requires 4320 sq. ft. less ground area than the old tower—enough to allow for the addition of four 30 ft. by 36 ft. cells for future requirements.

* * *

DESIGN CONDITIONS

Capacity	48,000 U.S. gpm
Inlet water temperature	120° F
Outlet water temperature	85° F
Wet bulb temperature	80° F

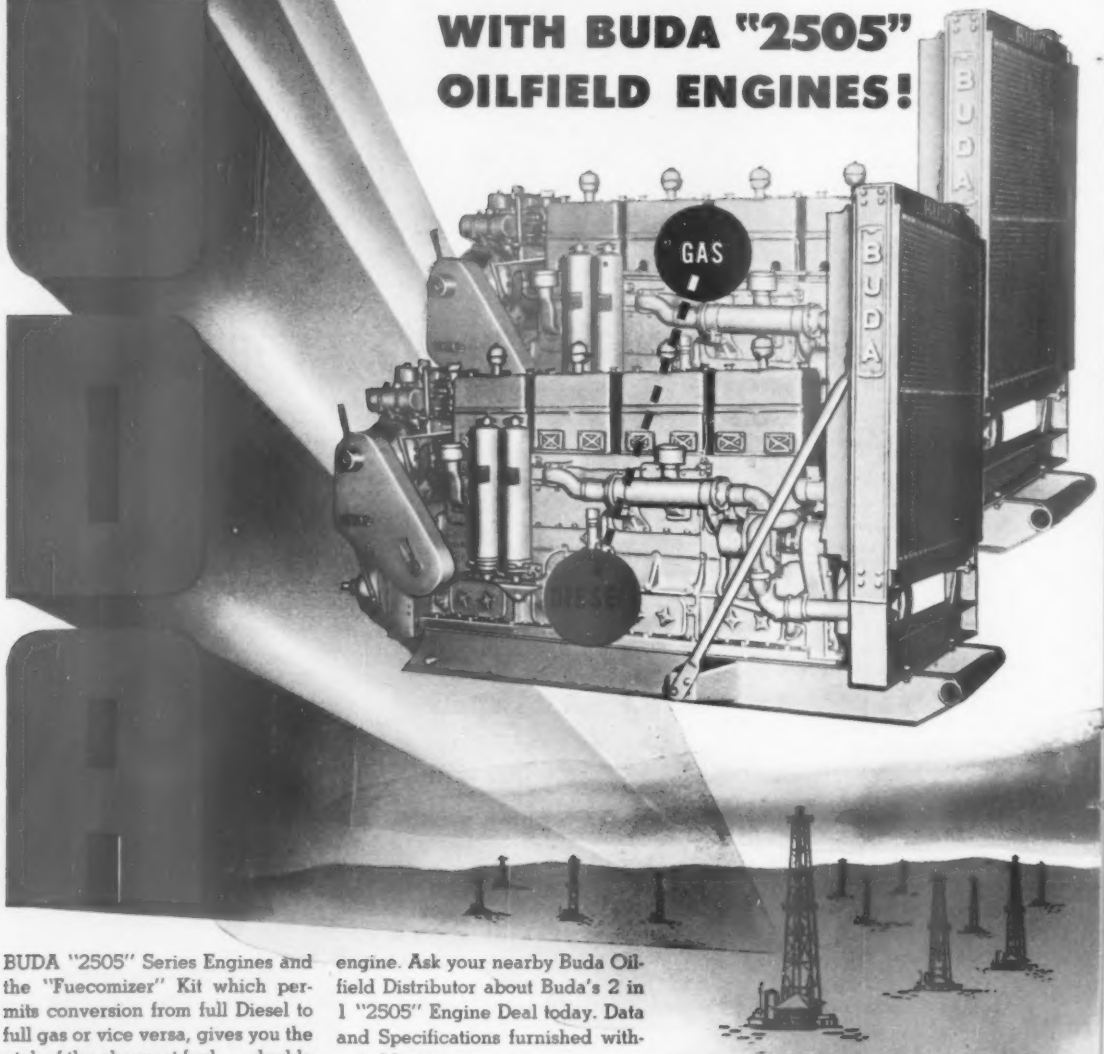


FOSTER WHEELER CORPORATION, 165 BROADWAY, NEW YORK 6, NEW YORK

FOSTER WHEELER

get Double protection at ½ the cost...

WITH BUDA "2505" OILFIELD ENGINES!



BUDA "2505" Series Engines and the "Fuecomizer" Kit which permits conversion from full Diesel to full gas or vice versa, gives you the pick of the cheapest fuel . . . double protection against high fuel costs for little more than the price of one engine. Ask your nearby Buda Oilfield Distributor about Buda's 2 in 1 "2505" Engine Deal today. Data and Specifications furnished without obligation.

The Buda Company, Harvey, Ill.

BO-24

BUDA Oilfield Distributors are located in: Dallas • Tulsa • Los Angeles • Houston • Oklahoma City • Seminole • Wichita Falls • Shreveport • Bakersfield • Tinsley • Pampa Great Bend • Long Beach • Kilgore • Mt. Carmel, Ill. • Alice • Odessa • Casper • Denver • Brookhaven • New York City(Export)and in Canada at Calgary and Edmonton

VICKERS *Long Stroke*
HYDRAULIC PUMPING

Provides

THESE ADVANTAGES:

- **Fewer Stress Reversals**
- **Lower Range of Stress**
- **Lower Acceleration Forces**
- **Lower Peak Loads**
- **Lower Standing Valve Velocities**
- **Constant Stroke Rate**
- **Greater Sub-Surface Efficiency**

Vickers Model JV-30400-A • 30 ft. stroke 6 strokes per minute • 35,000 lb polished rod load capacity Also available in 20 foot stroke

THESE ADVANTAGES

Result in

- **Lower Maintenance Costs**
- **Less Down Time**
- **Increased Production**
- **Increased Profits**

These Results Are Field Proven . . . they have been Checked ✓ and Double Checked ✓✓

Write for
NEW VICKERS
BULLETIN
No. 52-51

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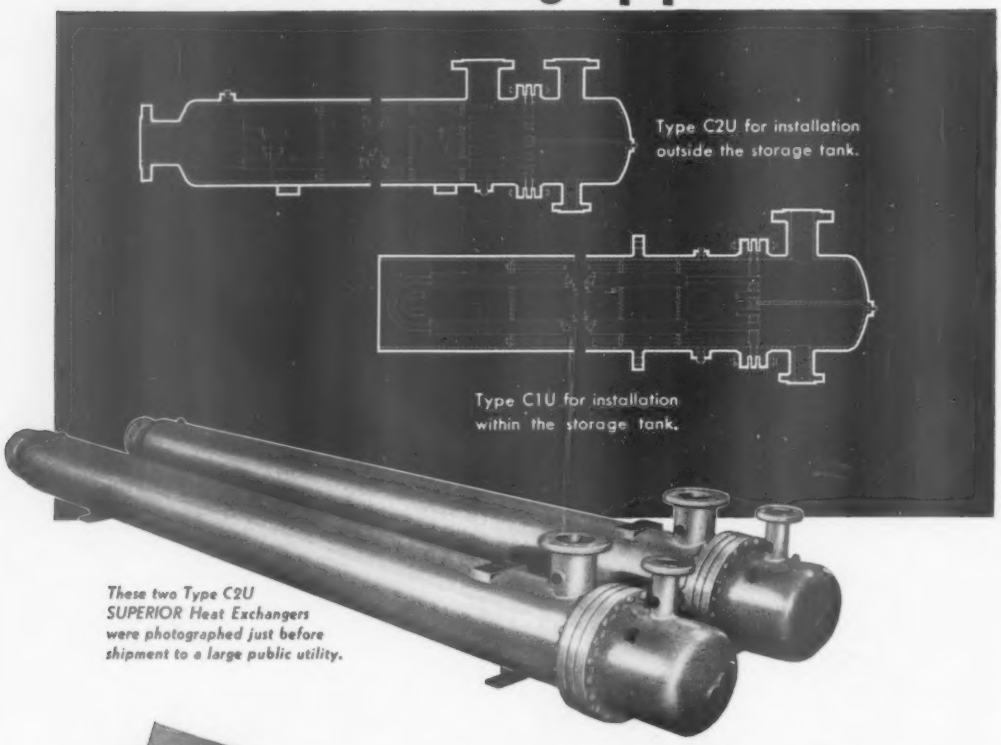
Division of the Sperry Corporation
Petroleum Equipment Department
2160 EAST IMPERIAL HIGHWAY • EL SEGUNDO, CALIF.
Engineers and Builders of Oil Hydraulic Equipment Since 1921

6043

How to *HURRY* heavy oils through pipelines . . .



These two Type C2U SUPERIOR Heat Exchangers were photographed just before shipment to a large public utility.

This eight-page, two-color catalog describes basic design features of heads, shells, and tube bundles. Write today for Catalog No. 520.

In process plants, refineries, bulk storage plants and tank farms, SUPERIOR Tank Heaters provide an efficient and highly dependable solution to the problem of heating heavy oils. Their "finned-U-tube" design provides greater heat-transfer surface combined with compactness.

Other SUPERIOR Heat Exchangers are designed specifically for boosting oil temperatures at pumping stations along the line, for cooling the pumps, and for the countless other applications for heat exchangers in the petroleum industry.

Our engineering department invites your inquiry regarding any proposed application as a basis for a specific engineering recommendation.

for performance you can ***BANK*** *on*

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR HEAT EXCHANGERS

New wonder metal to wearproof

SPRAY NOZZLES

CHECK VALVES

ORIFICES

OTHER SUGGESTED APPLICATIONS

Sheer blades for molten glass
Core pins for ceramic baking
Fishing rod guides
Centrifuge nozzles, separating equipment
Bearings where corrosives are present
Textile guides, and many other parts where corrosion with abrasion and erosion must be resisted

Carboloy Chrome Carbide protects parts, fights corrosion, abrasion, erosion

CORROSION TESTS

Grade 608 Chrome Carbide—Other Cemented Carbides—Stainless Steel

LOSS IN WEIGHT IN MILLIGRAMS PER SQUARE DECIMETER PER DAY AVERAGE OF 10—24 HOUR IMMERSION PERIODS

Test	Chemical Used	RESULTS				
		Series 600 Chrome Carbides	Other Cemented Carbides			18-8 Stainless Steel
			WC + Co	WC + TaC + TiC + Co	WC + TaC + Co	
1	10% H_2SO_4 (10% Sulphuric Acid)	55	158	302	135	1650
2	50% H_2SO_4 (50% Sulphuric Acid)	31	100	120	81	7300
3	37% HCl (37% Hydrochloric Acid)	190	600	650	160	Total Loss
4	35% HNO (35% Nitric Acid)	19	250	330	110	45
5	HNO_3—HCl (Aqua Regia)	810	2820	4500	1550	Total Loss
6	NaBCl .07 Cl_2 PH 9 (Sodium Hypochloride)	100	230	1000	158	11
7	5% NaOH (5% Sodium Hydroxide)	0.6	22	7	12	1.0
8	50% NaOH (50% Solium Hydroxide)	1.0	3	3	4	2.0
9	5% $CaCl_2$ (5% Calcium Chloride)	0.3	41	24	27	1.3
10	1.0% Citric Acid	0.6	176	150	160	2.0
11	5.0% Lactic Acid	1.5	200	170	255	5.1

Acids, alkalis, heat, oxidation, erosion, abrasion cutting down the life of your equipment parts?

Then here's a brand new Carboloy created-metal worth checking into. It's Grade 608 Chrome Carbide – not a cutting metal, but the first member of an entirely new family of metallic carbides especially for wearproofing . . . outstandingly effective in resisting corrosion and erosion combined with abrasion.

In addition, chrome carbide is lightweight, non-magnetic, stable, strong, machineable . . . has a coefficient of thermal expansion similar to that of steel. Chemical test results, left, for example, show how chrome carbide stands up under acids. For full details on physical properties, characteristics, application histories, etc., of this new created-metal, send coupon for free Chrome Carbide data sheets.

USE TUNGSTEN CARBIDE WHERE ABRASION IS THE PRIME FACTOR

Carboloy Tungsten Carbide is currently doing an excellent percussion wearproofing job in seismographic drilling. Its exceptional resistance to abrasion is the prime factor; it greatly increases product life and performance in such applications as tri-cone rotary bits, flow beans, gas lift valves in oil and gas separators, and in many other parts. Send coupon for free data on these Carboloy Tungsten Carbide advances, too.

"Carboloy" is the registered trademark for the products of Carboloy Department of General Electric Company

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

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MAIL COUPON TODAY FOR FREE CHROME CARBIDE DATA SHEETS

CARBOLOY Department of General Electric Company
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☐ Please rush me free Technical Bulletin WR-104 containing Chrome Carbide Data Sheets. ☐ Also, details on Tungsten Carbide oil-field applications.

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Company _____

Address _____

City _____ Zone _____ State _____

Wagner
ELECTRIC MOTORS
... the choice of leaders in industry

OIL WELL PUMPING MOTORS

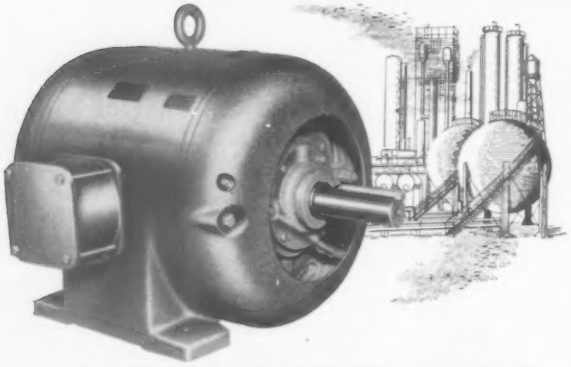
... POLYPHASE, SINGLE-PHASE

These cast-iron frame motors, especially designed for outdoor service, have double-end ventilation. Baffles inside the end-plates direct a cooling air flow around the stator iron and windings, while retarding the entrance of water. Motor windings are specially treated for outdoor service and the conduit box is moisture-proof and dust tight. These motors are available in ratings through 75 hp and are built in two electrical types: high torque, normal slip; and high torque, high slip.

Wagner MOTORS

time-tested favorites of the oil fields

in the field ... in the refinery



EXPLOSION-PROOF MOTORS

These polyphase motors have been approved by Underwriters' Laboratories for Class I Group D hazardous locations. They feature housings strong enough to withstand explosion inside the motor, machined fits long enough to prevent the escape of flames to the surrounding atmosphere, and heat capacity great enough (even under abnormal operating conditions) to prevent the motor from reaching a temperature which would ignite surrounding gases. These totally-enclosed fan-cooled motors are available in ratings through 250 hp, with a choice of cast-iron frame or steel frame construction.

For locations where only single-phase current is available, Wagner can furnish capacitor-type oil well pumping motors.

Write for Bulletin MU-137 on Oil Well Pumping Motors and Bulletin MU-185 on the complete line of Wagner Motors. Thirty-two branch offices are ready to assist you in any motor application problem.

Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6389 Plymouth Ave., St. Louis 14, Mo., U.S.A.

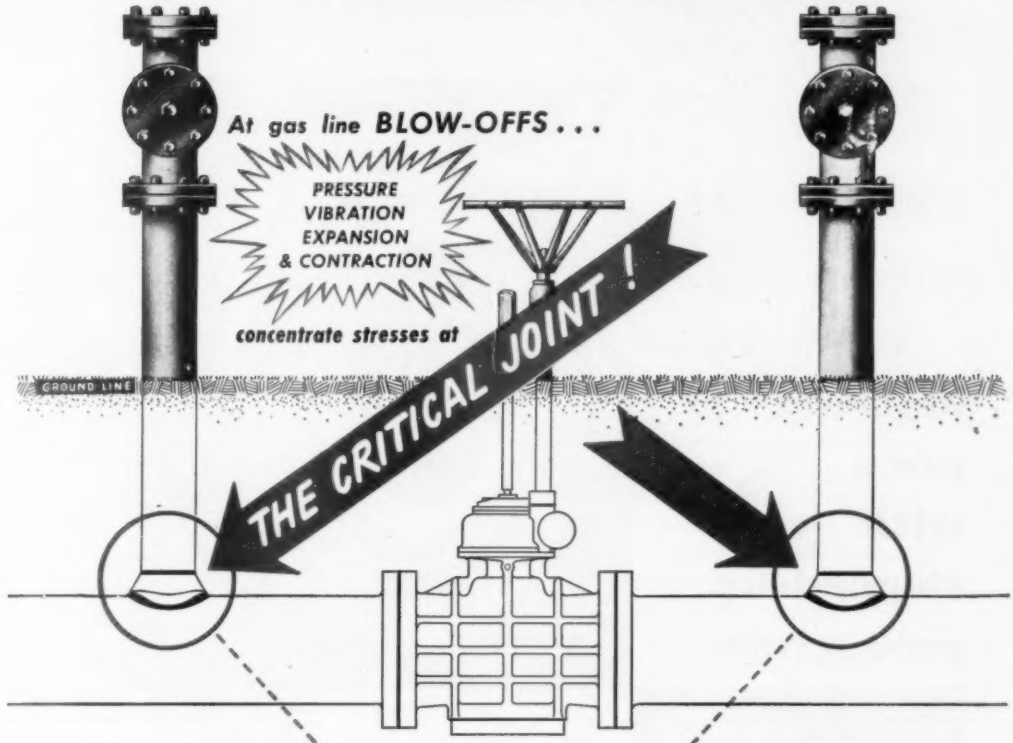
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

M53-8

ENGINEERED REINFORCEMENT

FOR YOUR BRANCH CONNECTIONS



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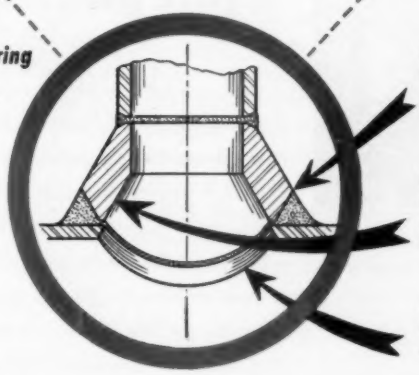
Welding Fittings
to insure
permanent strength



Reinforcement where both the mechanical and internal stresses are most severe

Funneled to relieve mechanical stress concentrations and improve fluid flow

Shaped and beveled for clean, quick and economical installations

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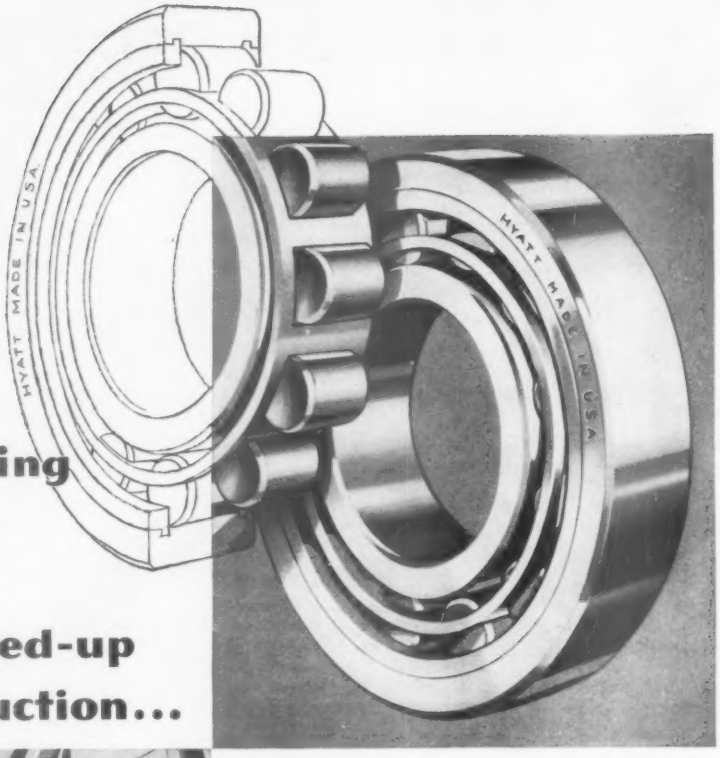


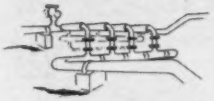
Keeping pace with stepped-up production...

Hyatt precision bearings

Built to carry the BIG loads, Hyatt Roller Bearings are playing an increasingly important role in America's rising petroleum production. Peak production calls for top efficiency of operating equipment, and throughout the industry Hyatts are reducing maintenance costs and shut-downs because they last longer under continuous heavy-duty operation. If Hyatt bearings are not already standard in the equipment you purchase, they can be had upon specification. Always insist upon "performance-proved" Hyatts, the first choice of equipment builders in all branches of industry, agriculture and transportation. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

at the wells . . .

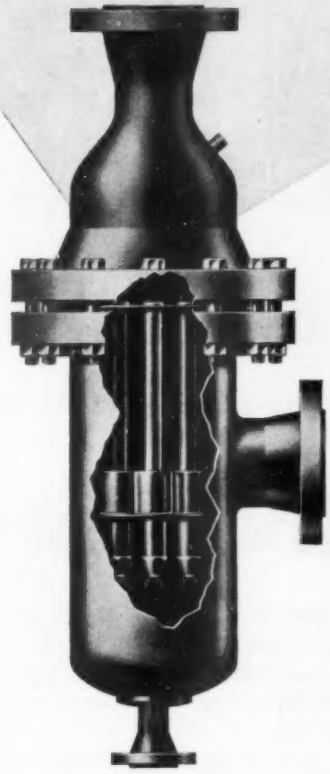


in the pipelines . . .

DRY GAS SCRUBBERS

assure you efficient natural gas cleaning

without liquid filters



Aerotec Dry Gas Scrubbers offer you a highly efficient means of removing dusts and distillates from gas. In the "Big Inch" and many other installations at wells and in pipelines, these units are daily proving the advantages of *dry* scrubbing.

The Aerotec Gas Scrubber uses no oil or other liquid as a filtering medium. This eliminates carryover and other normal disadvantages of conventional type scrubbers. By keeping the gas clean and dry, Aerotec units help prolong the life of compressors and reduce pipeline maintenance.

Aerotec precipitating tubes are the heart of this dry scrubber. Gas passes through these multiple, small-diameter tubes, and the foreign matter is separated from the gas by centrifugal force. Discharge is continuous.

Space-saving compactness, light weight, and piping simplicity of the Aerotec Dry Gas Scrubber permit easy installation. The standard units are available in practically any size up to 100,000,000 SCFD. Manifolding meets needs for larger capacities. Our representative will gladly recommend the Aerotec Scrubbers your specific gas-cleaning problem requires. Call or write today.

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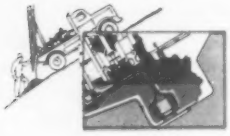
—Multiple, free-acting differentials compensate for the differences in travel of all wheels. This reduces drive line strains, eliminates needless tire wear and scuffing.

Proper Weight Distribution
—Only a true 4x4 or 6x6 can give you the added weight on the front wheels needed for necessary traction to work in any footing, terrain, or weather.

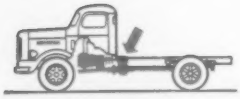
Compare and you'll choose FWD

. . . because features like these help you get work done on schedule!

There's an FWD for Every Job
—FWD models for Geophysical work, from the Light-Duty LD to heavy-duty 6x6 transporters, are dependable units, designed for rugged oil field service.



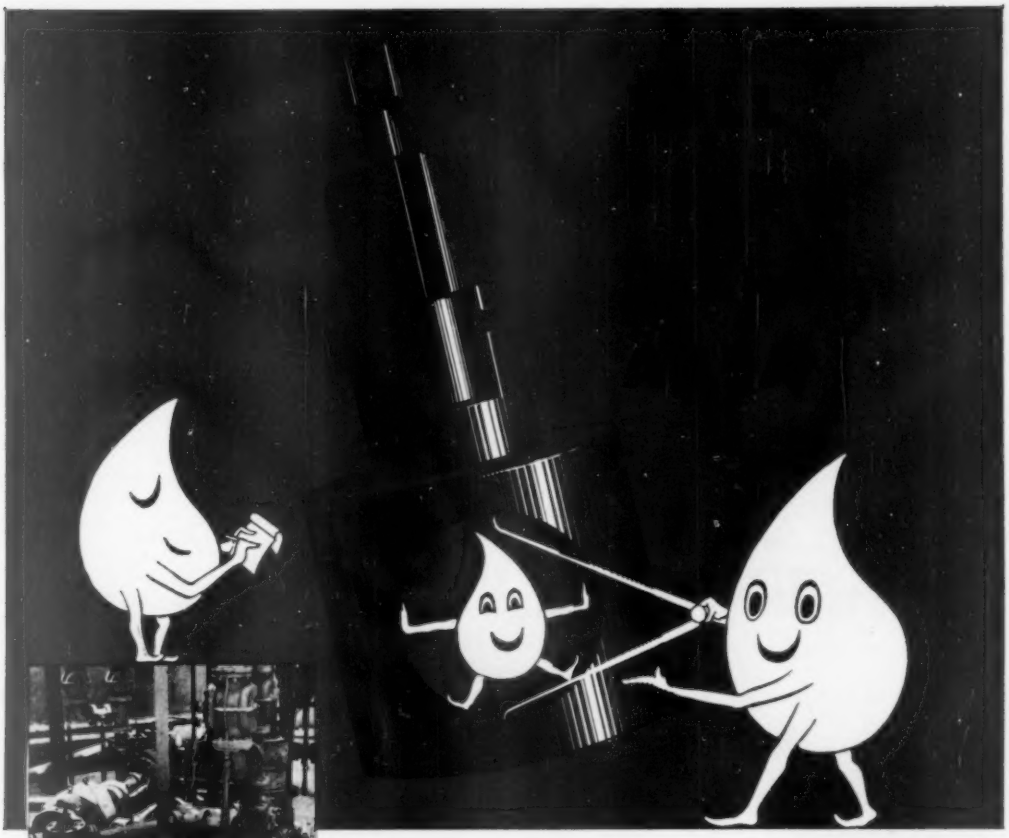
High Climb Oil Sump
—Keeps oil pump constantly submerged. Valuable in Geophysical service—prevents "oil starvation" of engine. An exclusive FWD feature that allows truck or truck-operated tools to work on steepest inclines or slopes.

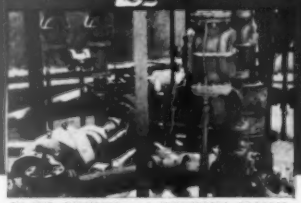


Auxiliary Transmission
—Doubles the number of gear ratios . . . provides extra low gear ratios for work at extreme low speed. Available on all FWDs, as optional or standard equipment.

Get More Work Done At Less Cost Per Job . . .
Designed with the help of veteran oil men, FWDs have many performance-boosting features. An FWD will get supplies and equipment through where other rigs fail . . . handle more work per day, more jobs per year . . . cost less to service and maintain. Your FWD Dealer will be happy to give you all the facts on these versatile tools. Contact him or write direct to FWD. THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis. *Canadian Factory,* Kitchener, Ontario.

Built by the makers of America's Foremost Heavy-Duty Trucks





IN THE CHEMICAL and INDUSTRIAL PROCESSING FIELD a.c.f. Round Port CYLINDRICAL Plug Valves handle abrasive ladings, such as cement slurry, coal wash water, etc., without erosion—and have long life.

IN PETROLEUM and GAS INSTALLATIONS a.c.f. Valves give full-area flow with fast, positive shut-off.

IN SEWAGE PLANTS the a.c.f. CYLINDRICAL Plug shears obstructions on raw sewage lines . . . provides uninterrupted flow.

a.c.f.'s Full Round Port, CYLINDRICAL Plug Valve has a straight level-through flow passage the same size and shape as the pipe itself! This means fast unobstructed flow of heavy or viscous ladings, solids in suspension, all liquids and gases.

And—there is full straight-through pipe area in a.c.f.'s Rectangular Port, CYLINDRICAL Plug Valve, too.

Investigate—you need "full pipe size area" valves for economical processing.

a.c.f. CYLINDRICAL FULL PIPE AREA PLUG VALVES

Write for Catalog 4-OG, American Car and Foundry Co., Valve Division, 1502 E. Ferry Ave., Detroit 11, Michigan

Representatives in 50 Principal Cities

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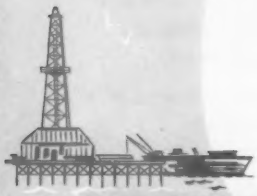
INLAND WATERS



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FOR ANY DRILLING JOB

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DRILLING CONTRACTORS

OIL INDUSTRIES INC.

HEADQUARTERS
OKLAHOMA CITY, OKLA.

They Say—

How About That Price Hike?

"All applications for adjustments of petroleum price ceilings in California, while they differ in detail, are in agreement on these points: They all allege and substantiate by close and detailed economic studies of the California petroleum situation that California is in fact unable to supply its full petroleum demand, that price ceilings do in fact account for resultant shortages, and that petroleum price adjustments in California will in fact not affect petroleum prices elsewhere.

"Why, then, has there been no decision even at the Branch level of OPS, nor the Division level, let alone by the final authority within the agency? Please be reminded that this matter has been pending for a period of 9 months, that it is a matter of utmost importance to the national security, particularly in view of the present Korean War and the geographical relationship of California petroleum supplies thereto, and that all concerned recognize that the California case is on all fours with Section 7(a) of CPR 32. What else is there to consider? Upon what grounds can a decision be further postponed?"

W. H. Geis, chairman, California Crude Oil Producers Committee, in a letter to Michael V. DiSalle, Economic Stabilization Administrator.

Truman's About-Face on Oil

"President Truman personally ordered the federal grand jury inquiry into the alleged world oil monopoly that resulted in a set of criminal indictments about 6 months ago.

"President Truman personally offered to call them off in return for such disclosures as a study of oil-company books would show the Government for use in a civil antimonopoly suit.

"What happened to bring about this change of the President's mind? . . .

"Mr. Truman didn't say why he shifted position . . . The factors, however, stick out like mushrooming atomic-explosion clouds in a clear desert sky.

"The first demands in years for the nationalization of Venezuela's oil fields were heard the day after it became news that the U. S. was charging five American and two foreign oil companies with controlling petroleum prices. A Lebanese newspaper also reacted quickly, warning its government

Cut welding costs

...with "Southern's"

50-ft. pipe sections

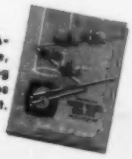
The two illustrations above show one of Southern's pipe mills in operation. Note steel coil being fed into mill in top photo.

FOR EXAMPLE: The use of "Southern" 50 ft. pipe sections, instead of shorter lengths, saves up to 40% in field welds. These savings add up to big cost reductions. As a result, lower and more profitable bids can be submitted . . . overall pipeline installation costs can be cut.

"Southern" pipe offers many other economies. Light weight steel pipe means lower freight costs. Automatic production means lower original costs. Exact tolerances mean easier installation of valves and fittings.

Complete range of sizes for all gathering lines

"Southern's" four big mills have a capacity of many miles of pipe per day! Diameters range from 4" through 14½". All pipe conforms with A.S.T.M. Specification A-139 and can be supplied bare or with Asphalt, Coal Tar, Cement Mortar or other protective coating, as specified.



NEW 42 PAGE CATALOG gives valuable price, weight and engineering data. A copy will be mailed free upon request.

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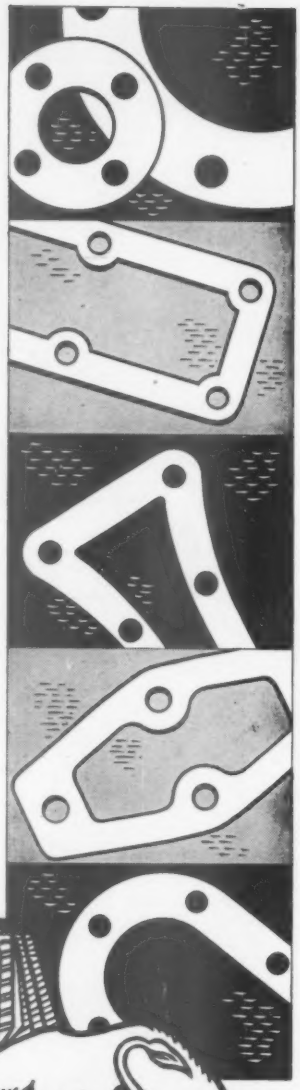
Southern Pipe & Casing Co.

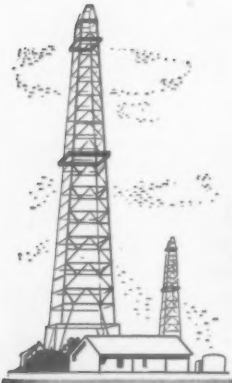
Arrow Highway and Irwindale Avenue • Azusa, California

JOINTINGS *for the* PETROLEUM INDUSTRY

Our range of packings and jointings comprises qualities suited to the exacting needs of the petroleum industry and resistant to the oils and solvents used therein.

We also manufacture Cord V Belts to the A.P.I. Specification.





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A80

that it was evidently dealing with skunks and foxes who wanted to prospect for oil there; the U. S. admitted as much. Several other foreign governments began thinking about revising their oil agreements with the U. S. In other words, the U. S. Department of Justice was slitting the throat of the U. S. Department of State, which was trying to get along with everybody, on the mere assumption that something might be amiss. It didn't make sense.

"This is one world, but it's a pretty complex one, and no place for children to be wandering without a bright escort."

Editorial in the Tulsa Tribune.

Energy Creates Wealth

"When a farmer switches from horsepower to tractor power, he not only increases the physical efficiency of his land. He releases several acres of land from the job of providing fodder for his team. New land has been "created" simply by switching from hay energy to petroleum energy.

"The same land-building process occurs when the gases are taken from modern refineries and are converted into synthetic rubber, alcohol, or one of the many petroleum-based plastics and fibres. Humanity ends up with either more material than before, or as much material plus a bonus of land now freed for other uses.

"One can regard extra energy as land, as I have done. One can regard it as productivity, converting thermal units into the equivalent of muscular energy —or as leisure, which is the outgrowth of productivity. The outcome is essentially the same—energy is the measure of humanity's capacity to master nature."

John R. White, executive vice president, Imperial Oil, Ltd., addressing the Transportation and Customs Bureau, Vancouver Board of Trade, Vancouver, B.C.

CALENDAR

JAN.

27-28 Kansas Oil Men's Association, annual convention, Hotel Lassen, Wichita.

28-30 Symposium on Instrumentation for the Process Industries, Agricultural and Mechanical College of Texas, College Station.

FEB.

1- 6 American Society for Testing Materials, meeting of Committee D-2 on Petroleum, Hotel Cleveland, Cleveland.

2- 6 Corrosion short course, sponsored by National Association of Corrosion Engineers, University of California, Berkeley.

5- 7 Missouri Petroleum Association convention, President Hotel, St. Louis.

12-13	Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Beaumont, Beaumont, Tex.
16-21	American Institute of Mining and Metallurgical Engineers, annual joint meeting of petroleum, metals, and mining branches, Statler Hotel, Los Angeles.
18	Instrument Society of America, sixth annual New York regional meeting, Hotel Statler, New York.
18-19	Pacific Coast Gas Association, technical services conference of technical section, Hollywood, Calif.
27	Natural Gasoline Association of America, regional meeting, Scharbauer Hotel, Midland, Tex.

MAR.

1- 6	American Society for Testing Materials, Committee D-2 meeting on petroleum, Hotel Cleveland, Cleveland.
2- 6	American Society for Testing Materials, spring meeting, Statler Hotel, Detroit.
4- 6	American Petroleum Institute, division of production, Southwestern district spring meeting, Hilton Hotel, Fort Worth.
8-11	American Institute of Chemical Engineers, Buena Vista Hotel, Biloxi, Miss.
15-20	American Chemical Society, petroleum division, spring meeting, Statler Hotel, Los Angeles.
16-20	National Association of Corrosion Engineers, ninth annual conference and exhibition, Hotel Sherman, Chicago.
18-20	American Petroleum Institute, division of production, Mid-Continent district meeting, Mayo Hotel, Tulsa.
23-25	Western Petroleum Refiners Association, annual meeting, Plaza Hotel, San Antonio, Tex.
23-26	American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, and Society of Exploration Geophysicists, joint annual meeting, Sam Houston Coliseum, Houston.
23-27	Western Metal Exposition and Congress, technical sessions, Statler Hotel, Los Angeles.
25-27	Society of Automotive Engineers, national production meeting, Hotel Statler, Cleveland.
28	North Texas Oil and Gas Association, annual meeting, Kemp Hotel, Wichita Falls, Tex.
30-31	Texas Independent Producers and Royalty Owners Association, annual meeting, San Antonio.
30-Apr. 1	Mid-West Gas Association, Broadmoor Hotel, Colorado Springs, Colo.

APR.

7- 9	Petroleum Industry Electrical Association, annual convention and exhibit, Shamrock Hotel, Houston.
8-10	American Petroleum Institute, division of production, Eastern district meeting, William Penn Hotel, Pittsburgh.
15-17	National Petroleum Association, midyear meeting, Cleveland.
20-22	American Petroleum Institute, Division of Transportation, products pipe-line conference, Hotel Muehlebach, Kansas City.
21	Association of Consulting Chemists and Chemical Engineers, Inc., Hotel Belmont Plaza, New York City, symposium and dinner.
21-23	Southwestern Gas Measurement Short Course University of Oklahoma, Norman.

THE VICTAULIC® METHOD OF PIPING

EASIEST WAY TO MAKE ENDS MEET

Sizes: ¾" through 60"

TEES . . . ELBOWS . . . REDUCERS . . . the Victaulic Method features a complete line of modern, top efficiency, Full-Flow Fittings for use with world famous Victaulic Couplings!

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All Crudes are Alike to

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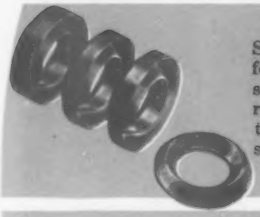
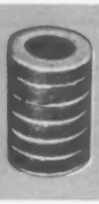
If you build pumps or valves for oil field service — or if you are concerned with their maintenance — try Chemiseal, the universal packing material. Made of TEFLON*it is impervious to all petroleum chemicals. There is no need to change packing for different types of crude. It is highly resistant to abrasion, serviceable from −110°F. to 500°F., stands up indefinitely where other packings fail rapidly.



Select Chemiseal Type 810-V packing for oil field valves. It provides necessary seal at low gland pressures and reduces torque required to operate the valve. Supplied in sets to meet specific requirements.

For oil field pumps—select Chemiseal No. 711 packing, extremely effective for rotating or reciprocating shafts. Provides a low friction, 2-way seal that not only prevents axial seepage, but also seals against shaft and stuffing box as well. Supplied in sets to meet specific requirements.



For emergency or field service—select Chemiseal Extruded Packing No. 620EG (Graphite impregnated) or 620EM (with Mica). Suitable for valves, pumps, any stuffing box application. Made in continuous lengths, sold by the foot. Ask your supply house or write for catalog.

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*duPont's trademark for its tetrafluoroethylene resin

22-24	American Association of Petroleum Geologists, Rocky Mountain section meeting, Casper, Wyo.
24-25	Interstate Oil Compact Commission, spring meeting, Roosevelt Hotel, New Orleans.
26-29	American Institute of Chemical Engineers, Chemical Institute of Canada, joint meeting, Royal York Hotel, Toronto, Ont.
27-28	Independent Petroleum Association of America, mid-year meeting, Jefferson Hotel, St. Louis.
Apr. 29-May 1	Natural Gasoline Association of America, annual convention, Rice Hotel, Houston.
Apr. 30-May 1	American Gas Association, transmission and storage conference, Edgewater Beach Hotel, Chicago.

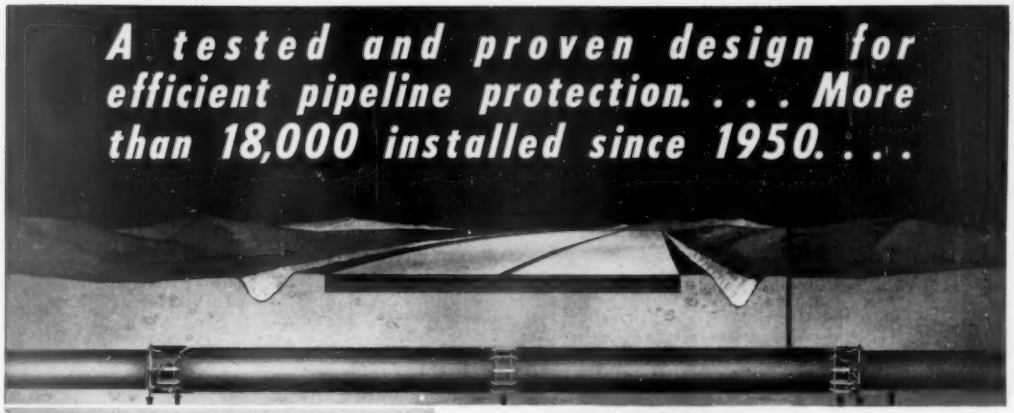
MAY

4- 5	American Petroleum Institute, division of marketing, midyear meeting, Baker Hotel, Dallas.
6- 8	American Society of Training Directors, ninth annual conference, Sheraton Plaza Hotel, Boston.
7- 8	American Petroleum Institute, Rocky Mountain district, Division of Production, spring meeting, Gladstone Hotel, Casper.
11-13	Southern Gas Association, Jung Hotel, New Orleans.
11-14	American Petroleum Institute, Division of Refining, midyear meeting, New York.
13-14	Pacific Coast Gas Association, annual gas supply and transmission conference, Santa Barbara, Calif.
14-23	International Petroleum Exposition, Tulsa.
15-16	International Gas Union, council meeting, Paris, France.
24-27	American Gas Association, production and chemical conference, Hotel New Yorker, New York City.
25-29	American Society of Mechanical Engineers, annual conference and exhibit, oil and gas power division, Hotel Schroeder, Milwaukee.
28-29	Western Petroleum Refiners Association, regional technical-industrial relations meeting, Broadview Hotel, Wichita.
28-29	Natural Gas and Petroleum Association of Canada, London, Ont.

JUNE

2- 3	American Petroleum Institute, Division of Production, Pacific Coast District, Statler Hotel, Los Angeles.
4- 5	Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington, Ky.
7-12	Society of Automotive Engineers, summer meeting, The Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J.
14-18	Canadian Gas Association, Windsor Hotel, Montreal, Canada.
15-19	American Petroleum Institute, Division of Production, midyear committee conference, Hotel William Penn, Pittsburgh.
16-19	American Welding Society, national spring technical meeting, Shamrock Hotel, Houston.
18-19	Western Petroleum Refiners Association, regional technical-industrial relations meeting, Conrad Hilton Hotel, Chicago.
18-19	Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.
JUNE 29-JULY 3	American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

A tested and proven design for efficient pipeline protection. . . . More than 18,000 installed since 1950. . . .



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Provide low-cost, dependable protection for right-of-way crossings . . . Simple to install with a common wrench . . . Impervious to pipe coatings . . . Support blocks center pipe in casing, spacer blocks provide clearance through casing . . . Available for all combinations of pipe and casing diameters.

TYPE "L" WmSEAL CASING BUSHINGS

Provide a water-tight seal even under the worst conditions of out-of-round casing . . . Unaffected by dirt, moisture or backfill during or after installation (no dope, adhesive or shield required) . . . Electrical insulation of pipe from casing provides economical cathodic protection.

Easily installed with common hand tools.

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THE PIG WITH THE POKE CLEANS PIPE LINES

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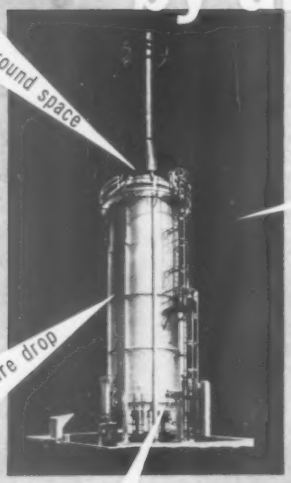
most efficient by any comparison

minimum ground space



simplicity of design and construction

maximum fuel efficiency

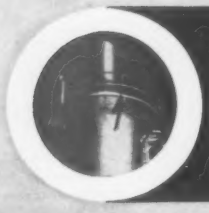
low pressure drop

better heat distribution

low maintenance . . .

is a significant feature of all Petro-Chem Iso-Flow Furnaces . . . their design includes vertical tubes which completely cover the interior wall surface thus maintaining a low wall temperature. The low wall surface temperature greatly lengthens the life of the refractory and insulation . . . their even heat characteristic eliminates hot spots on tubes . . . these low maintenance factors highlight the experience of more than 1,000 installations demonstrating that *low maintenance* is assured with all Petro-Chem Iso-Flow Furnaces.

More than 1,000 are in operation throughout the world in the petroleum, chemical and allied industries . . . for all processes and for any duty, pressure, temperature and efficiency . . . and all Petro-Chem Iso-Flow Furnaces are predominantly satisfactory.



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THE OIL AND GAS
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TULSA, OKLAHOMA

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JOURNALLY Speaking

Some Old, Some New

HERE we are again with the Big Yellow Book's annual review and forecast number, and this year it's bigger and better than ever. We've changed things a bit and added several new features to make it more useful to more readers.

For example, there's a news chronology of the year—several pages of brief paragraphs, arranged by months, giving the highlights of the more important events in the domain of oil.

Another brand-new feature is the collection of quotable quotes from some of the industry's leaders in various divisions and areas. These are not just the usual generalized year-end statements handed out to the press, but were especially prepared for this issue.

Then there are brief summaries of business costs and market prices, not detailed at great length but designed to point out trends which influence the course of operations in every branch of the industry.

Refiners get a couple of new features, too—discussions of trends in petrochemicals and in refinery processes and operation, as interpreted by George Weber, our refining editor. Dahl Duff, our international editor, kicks in with penetrating analyses of trends in world crude production and the growth of imports.

And of course there are all the old, looked-for features of this annual issue, features too numerous to mention but which the industry has been using to its great advantage for many, many years. Where else can you get so much for your money?

On Good Limbs

WE'RE not afraid of going out on limbs with all the predictions in this issue because we're sure of our method. There's no mystery about it. We have editors who know their stuff. They know where to get information and what to do with it. We'll cite just three examples:

1. Our estimate of proved reserves is prepared by Phil Ingalls, an experienced geologist. All year long he keeps track of new discoveries and extensions and revisions of older fields. Late in the fall he takes to the road to exchange notes with leading geologists and production engineers in various areas. So his final figures are not something pulled out of a hat, but the product of skilled reporting and expert interpretation. The A.P.I. reserve figure is prepared in the same manner but by a committee which gives good results but takes more time. Last year the A.P.I. came along 2 months later with a figure only 68 million barrels off from ours—a difference of only one-quarter of 1 per cent.

2. Our forecast of demand for crude and products is prepared by John Casper, an expert petroleum economist, who watches supply and market trends like a hawk all year. And just before Christmas he, too, made a swing around the country trading confidential estimates with the industry's top economists. The result is that his forecast is better than that of any individual company man because it is the expertly weighted composite of all of them.

3. Our annual forecast of drilling has been so good for so long that the industry relies on it implicitly. We get the information directly from the schedules of the operators. They wouldn't tell their competitors how many wells they're going to drill where, but they tell us. Last January we predicted that 45,446 wells would be completed in 1952, and some people snorted because the Government was calling for 50,000 wells. But when December 31 rolled around, that estimate proved to be only eight-tenths of 1 per cent off. But that's not all. In July we revised the prediction to 45,791 wells, and this proved to be only one-tenth of 1 per cent off the actual total of 45,840 completions.

These things aren't said to brag (much) but to point out how careful reporting by specialist editors produces results that can be relied on and that render a tremendous service to the industry.

It's things like this that make us the Oil Man's Bible.

Henry D. Ralph.

YOU CAN SAVE CASING

BY STAGE CEMENTING THE BAKER WAY

With only one string of casing you can cement off at the shoe *and* shut off surface water. Or you can cement a well with *two producing zones* and be assured of a good cement job for the upper zone. And you *never* need risk breaking down a comparatively weak formation by high cementing pressure and the extreme weight of a long cement column.

IT'S SIMPLE, SPEEDY AND SAFE to perform two-stage cement jobs with Baker Stage Cementing Collars (Product No. 200-F) in combination with other Baker Equipment. In addition to positive, mechanical closing of the cementing ports upon completion of the second stage, you are assured of these outstanding advantages:

1. After the second stage has been completed, an external steel sleeve with an oil-resistant synthetic rubber seal provides positive closure and prevents passage of fluid between the inside and the outside of the casing, regardless of the condition of the cement job at that point.

BAKER STAGE CEMENTING COLLAR

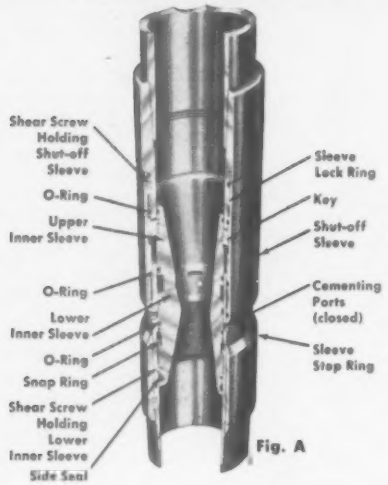


Fig. A

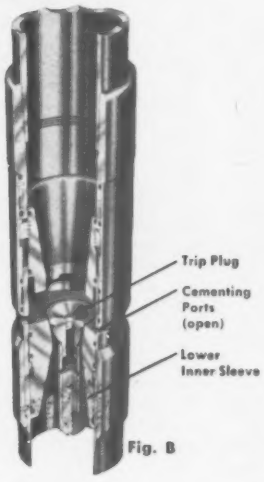


Fig. B

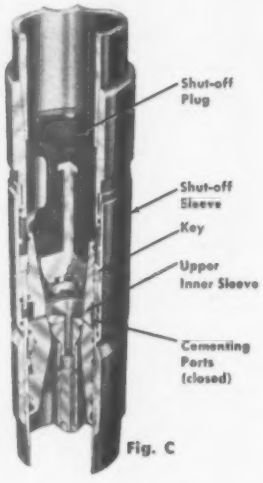


Fig. C

Fig. A—Ready for cementing the first stage. The cementing ports are covered by the Lower Inner Sleeve which is held in position by shear screws; shear screws also hold the Shut-Off Sleeve above the cementing ports.

FIG. B—Ready for cementing the second stage. After the Trip Plug is seated, application of hydraulic pressure shears the screws holding the Lower Inner Sleeve which moves downward, thus uncovering the cementing ports. The Trip Plug prevents passage of fluid into the casing below, and cement pumped into the casing will now pass through the cementing ports for the second-stage cementation.

FIG. C—Second-stage cementation is completed. The Shut-Off Plug has been pumped down the casing and pressure applied to shear the screws and move the Shut-Off Sleeve downward to close off the cementing ports. Note how the Sleeve Lock Ring has expanded to lock the Shut-Off Sleeve in position permanently covering the cementing ports.

2. The cementing ports of the Stage Cementing Collar may be opened at any time after completion of the first stage, and fluid may be circulated through the stage collar for any desired length of time before starting second-stage cementing.
3. Operation of the stage collar is effected by fluid pressure applications only, and no movement of the casing is required after the first stage of the cementation has been completed.
4. All internal parts of the Baker Stage Cementing Collar are constructed of readily drillable materials, and when drilled out there are no sharp shoulders or irregularities to interfere with the subsequent passage of tools through the collar.
5. Since the steel Shut-off Sleeve is on the outside of the Stage Cementing Collar, there is no possibility of accidentally opening the cementing ports when drilling out the internal mechanism, or later when bits or casing scrapers are run through the collar.

Ask any Baker representative or office for recommendations to make your stage cementing operations successful, "first-time" accomplishments.

BAKER OIL TOOLS, INC.

HOUSTON • LOS ANGELES • NEW YORK

Figures don't tell the industry's real growth

THE statistics in this annual review and forecast issue confirm in detail what has been generally felt for some time—that the petroleum industry will continue to expand during 1953 but its rate of growth will be smaller than in most postwar years.

But the real story of the industry's growth is not told by figures on numbers of barrels or numbers of wells, nor even in percentages. It should be remembered that a simple percentage increase of one year over the previous year becomes compounded rapidly because there is a bigger base each time.

As good an over-all index as any is the total demand met by the United States industry. The 1953 demand will be 3.4 per cent above 1952; this looks small compared with some recent years, but in volume it means that nearly 8,000,000 bbl. a day must be produced, transported, and processed.

THIS expected 1953 demand is 1.5 times the industry's volume in 1946, the first postwar year. It is twice the volume of 1939, when the prewar defense effort was starting. It is 2.6 times that of 1929, the historic boom year so often used as a business milestone. Some industries have not expanded at all since 1929, while oil is more than two and a half times as big.

But even such comparisons fail to tell the real story of how the industry has grown—what might be called its "expansion in depth." The industry is many times more complicated than it was in 1929, or in 1939, or in 1946. In every branch there are in use today new processes, new equipment, new methods which were unknown in those years.

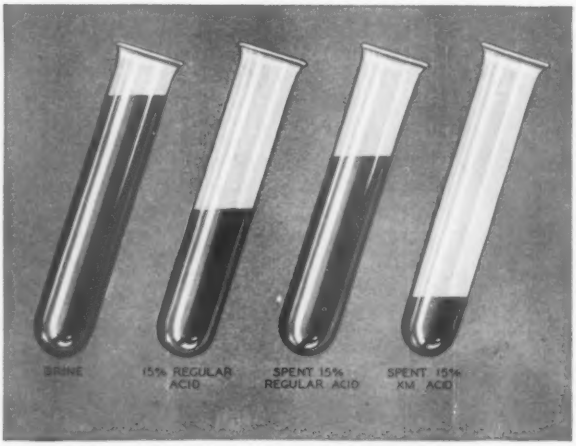
To mention just a few, consider the recent developments in deep drilling, geophysical interpretation, reservoir control, catalytic cracking and reforming, big-inch pipe lines, instrumentation, automatic controls, petrochemistry, electronic calculators. These require more men with new skills, more money for new equipment, more planning for new conditions—a never-ending progression.

OURS is not the same industry as prewar simply blown up to twice the volume. In many real respects it is an entirely new industry. It has new techniques, new problems, new opportunities. It is in such aspects that the industry has had its most significant growth, a growth not measurable by statistics.

And there is no ceiling on this type of growth. Volume expansion may return to a normal growth but there can be no leveling off in the expansion of new methods and new techniques, greater efficiency and greater service. This is the real measure of the growth of an individual, a company, or an industry.

GET MORE PRODUCTION FROM YOUR ACIDIZING

Acid treatments can be tailored to formation characteristics by using Dowell addition agents



This drawing illustrates the swelling-control effect of XM Acid on silicates. The same quantity of silicates has been placed in each of four different solutions. Note the relative volume occupied by the silicates in each case.

Successful acidizing is more than just a matter of pumping acid into a well. The real pay-off in increased production comes only when the *right* chemicals are used.

Yes, acids *are* different. By adding selected chemicals to the basic acid, treatments can be tailor-made to fit formation characteristics. Dowell . . . pioneer in acidizing . . . offers you a wide selection of these *addition agents* and the expert knowledge to determine the right combinations.

For example, Dowell XM Acid is designed to reduce the swelling of silicates of the clay type minerals found in certain dolomite and limestone producing formations. This silicate swelling, during conventional acid treatments, can delay well clean-up and actually reduce oil production.

A well completed in a dolomite formation known to contain swelling silicates was producing 15 BOPD. A Dowell XM Acid treatment boosted production to more than 80 BOPD . . . an increase much higher than could be expected with ordinary acid. After 60 days, production had leveled off at 60 BOPD. Treatment payout time was estimated at 3 days.

Other Dowell addition agents are designed to remove mud from producing formations; to speed reaction rate; to prevent emulsions; to remove "gyp"; to increase penetrating ability; to trace fluid movement; to increase acid weight.

GET THE FACTS
ON DOWELL ADDITION AGENTS

For more detailed information on Dowell Addition Agents, call your nearest Dowell station or write direct to Tulsa, Dept. A 11.

DOWELL SERVICE

Acidizing • Jel X* • Electric Pilot • Perfo Jet
Paraffin Solvents • Jelflake® • Bulk Inhibited Acid
Chemical Cleaning for Heat Exchange Equipment.

DOWELL INCORPORATED • TULSA 1, OKLAHOMA
A Subsidiary of The Dow Chemical Company

"First in Oilfield Acidizing . . . Since 1932"

*Service Mark

Look to DOWELL
FOR OIL INDUSTRY CHEMICAL SERVICE

THIS WEEK

INTERNATIONAL. — World production hit an all-time high again in November with average daily output of 12,844,100 bbl. . . . Figure includes non-Communist production of 11,700,000 bbl. daily. . . . ¶Small Italian tanker loads at Abadan and heads for unknown port. . . . Second attempt to move Iranian oil could result in the first test in a non-British court of ownership of crude and products stored in Abadan. . . . British indicate suit will be brought in whatever country the ship enters port. . . . ¶Anglo-Iranian assembling materials and equipment in Aden preparatory to beginning work on 100,000-bbl. refinery. . . .

TRENDS.—Demand on refineries for major products in the 2-week period ended January 17 was 6.8 per cent greater than in same weeks last year. . . . ¶The decrease in major product stocks for the 2 weeks was 1,000,000 bbl. greater than a year ago. . . . This extra reduction was not enough to make up for the actual gain in inventories in the last week of December and the very small decrease in the first week of this year. . . .

ACTIVITY.—Production of crude and lease condensate averaged 6,516,250 bbl. daily for week ended January 17, up 47,950 bbl. daily. . . . ¶Total well completions gained 76 wells for the week to 896. . . . Wildcat completions totaled 230 wells compared with 198 a week earlier and 202 in the same week last year. . . . ¶The fourth straight weekly drop in number of rotary rigs operating in United States brought the total down to 2,487 on January 20. . . .

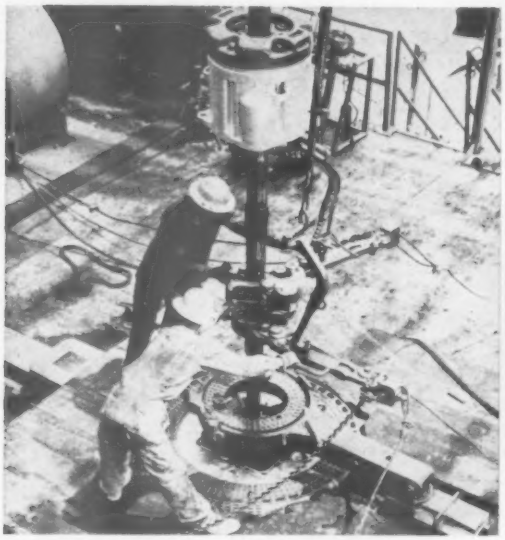
WINTER IN WYOMING finds operators still punching holes in the ground in the search for oil despite frigid aboveground temperatures. This is a drilling well of Continental Oil Co. in the high Rockies, in the Shoshone Canyon area northwest of Cody, Wyo.

REFINING.—Esso Standard announces huge expansion and modernization program for its 172,000-bbl. Bayway refinery at Linden, N. J. . . . Program will include first commercial installation of Hydrofining unit, which will treat cracked distillates to improve stability. . . . ¶Danaho Refining to begin expansion program soon at its Pettus, Tex., refinery. . . . Project will increase capacity from 4,500 bbl. to 9,500 bbl. capacity. . . . ¶Aurora Gasoline Co. lets contract for construction of 1,500-bbl. Platformer at its 5,700-bbl. Elsie, Mich., refinery. . . . ¶Shell announces it has postponed indefinitely plans for an $8,500,000 expansion of its lube-manufacturing facilities. . . . ¶Plans for 50,000-bbl. refinery in Puget Sound area of Washington announced by Shell, provided state amends its land laws. . . . Refinery would use Trans Mountain crude. . . .

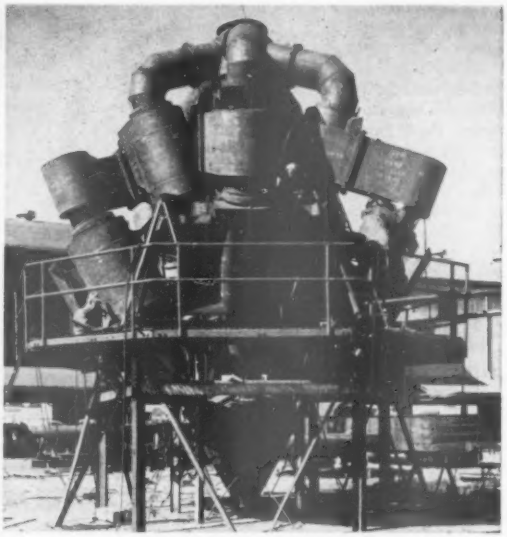
EXPLORATION.—Nation's operators completed 852 wildcats during December to bring total 1952 completions to a new record of 10,571. . . . ¶J. M. Huber makes what may be significant strike in Oklahoma's Beaver County. . . . Indicated discovery could extend Carter Oil Co.'s Greenough field by 3 miles or might prove to be a connecting link between Greenough and Light Ranch field. . . . ¶New discovery for Saskatchewan portion of Williston basin indicated in Tide Water wildcat near Forget. . . .

INDUSTRY.—Study indicates capital expenditures of petroleum industry this year will exceed 4 billion dollars. . . . Budgeted expenditures of large percentage of industry, extended to 100 per cent, indicated more than half of total, or about $2,460,000,000 will be spent for drilling and producing operations. . . . ¶Colorado Oil & Gas conditionally agrees to assign its gas reserves in San Juan basin to Pacific Northwest for its proposed line to Washington area. . . .

GOVERNMENT. — Administration officials clash as to whether price controls on oil should be lifted. . . . Joseph H. Freehill, OPS chief, says prices would rise "several hundred million dollars," while retiring Interior Secretary Oscar Chapman contends removing price lids would "not have a general inflationary effect on the economy." . . . ¶Department of Justice cuts off antitrust immunity for 19 oil companies submitting world supply and demand data to the Petroleum Administration for Defense. . . . ¶FTC reveals it is investigating the fuel-oil situation as one possibly calling for antitrust action. . . . ¶The commission also issues an order designed to get around the Supreme Court decision in the Standard Oil Co. (Ind.) case making "good faith" an adequate defense against charges of price discrimination. . . .



DRILLING-PRODUCTION: $2,460,000,000 budgeted!



REFINING AND PLANTS: $766,000,000 earmarked!

1953 Expenditures to Total $4 Billion

Oil-company budgets point to a total outlay this year of $4,009,000,000, a new record for industry development

Kenneth B. Barnes

THIS year the petroleum industry has budgeted for capital expenditures more money than it has ever spent before in any single year.

The total for domestic capital investments is $4,009,000,000.

Drilling and producing come first with $2,460,000,000. Refining comes second with $766,000,000. Transportation and marketing come next with $392,000,000 and $391,00,000, respectively.

Last year (1952) the petroleum industry in its domestic operations was spending at the rate of $3,600,000,000, according to an American Petroleum Institute estimate made at midyear. Later, however, the steel strike curtailed the total number of wells drilled in 1952 and delayed important refining and pipe-line projects.

The effect of the steel strike was to reduce by perhaps $150,000,000 to $200,000,000 the total 1952 expenditures.

The four-plus billions for 1953 are to be poured into new oil wells, refineries, pipe lines, tankers, and other transportation facilities, distribution outlets and many other new, modernized, or expanded operations. This will, of course, require a continuing flow of vast supplies of steel and other materials and equipment.

The American people are the most prolific users of petroleum in the world, and consumption in the postwar years has been skyrocketing. It is now 48 per cent higher than it was in 1946 and 79 per cent higher than 1941. Motor vehicles alone are consuming about 39 billion gallons of gasoline a year, and home oil burners are accounting for more than 11 billion gallons of fuel oil. It is to meet these increasing demands of today, and the projected increases of tomorrow, for peace or war, that the oil companies are carrying out their continuing program of expansion and development. The immensity of these budgeted expenditures scheduled for 1953 emphasize the staggering financial requirements of the petroleum industry.

So, if there is not another disastrous event like the steel strike, the year 1953 will see record high petroleum industry expenditures. If the total is realized, it will mean that capital outlays of the industry during the eight postwar years has amounted to some 23 billion dollars. By comparison, the industry's average annual expenditures during the 1936-40 period were only $717,000,000. The fact is that the anticipated 1953 expenditures for this single year are slightly in excess of the entire amount that was spent during the five prewar years prior to 1940.

About the outlook . . . There are factors bullish as well as bearish, but the

The Journal's Report

OF CAPITAL EXPENDITURES FOR 1953

Industry division—	Millions of dollars
Drilling and producing	$2,460
Refining	766
Transportation	392
Marketing and other	391
Total, U. S. oil industry	$4,009

Capital Expenditures by the U. S. Oil Industry

(In Thousands of Dollars. Source, A.P.I.)

	Estimated 1952 United States	Actual 1951 United States	Actual 1946-1950 United States
PRODUCTION:			
Crude Oil—Leases, Wells and Equipment	1,925,450	1,758,020	5,467,790
Natural Gas—Leases, Wells and Equipment	65,290	65,450	196,570
Natural Gasoline and Cycling Plants	82,170	52,690	318,760
All Other	38,810	37,160	119,830
Total Production	2,111,720	1,913,320	6,102,950
TRANSPORTATION:			
Pipe Lines—Crude Oil Lines	281,330	163,050	531,110
Products Lines	71,590	86,070	222,390
Natural Gas Lines	47,482	35,581	84,382
Marine (Tankers, Barges, Others)	119,890	47,330	435,210
Tank Cars	15,550	20,210	59,100
Motor Transport	7,500	13,450	58,300
All Other	4,160	24,110	28,990
Total Transportation	547,502	389,801	1,419,482
REFINING	565,740	302,950	1,792,670
CHEMICAL AND AMMONIA PLANTS	66,350	24,770	113,790
MARKETING	288,950	267,690	1,091,710
OTHER	41,497	49,297	214,558
TOTAL FOR U. S. (DOMESTIC) FACILITIES	3,621,759	2,947,828	10,735,160
TOTAL FOR FOREIGN FACILITIES	464,003	323,131	1,641,886
GRAND TOTAL	4,085,762	3,270.959	12,377,046

net is on the side of larger capital outlays by nearly all companies in the business.

Those who don't look for such high expenditures this year back up their opinion by citing the current worries over high inventories, slackening in the increase of the rate of demand, and—of possible great importance—repeal of the excess profits tax. Another but rather remote consideration insofar as domestic expenditures are concerned is the strong possibility that Abadan will be back on stream, further affecting the export picture.

The estimates for another substantial gain in expenditures this year are backed up especially by the general condition of the country's economy. No severe depression seems to be in sight. Even though the rate of industry demand may taper down to 3 or 4 per cent annual increase, the facilities called for by an 8,000,000-bbl. daily requirement are huge. The outlay required for simply replacing obsolete equipment, without considering the need for new and enlarged plant, is tremendous.

Exploration . . . On the exploration side, deeper wells, heavier equipment, trend of new operations into much more remote sections of the country, and more elaborate geophysics, all add up to more in terms of dollars.

Costs in the industry are up again this year. The higher steel prices following the strike mean more for this prime item. Some of the increased total of capital expenditures is, of course, sopped up in higher prices.

Domestic crude production this year is expected to show only a small—about 1½ per cent—increase over 1952. However, the necessity of building up reserve daily capacity above the 1,000,000 bbl. now existing—as sought by Washington—means that the producers of the country must make a continued large-scale effort to develop more production.

Another important consideration in any discussion of expenditures is the fact that there is a large carry-over from year-to-year. In many cases, expenditures being made in 1953 are part of long-range plans to develop production, increase refining capacity, or improve transportation, that were made two or three years ago.

Marketing . . . It is possible to get a quick argument on just how big marketing expenditures will be this year.

Some persons think marketing facilities of the industry are already overbuilt, and any company expanding much in this line is off the beam. On the other hand, in this analysis it must be considered that many marketing expenditures have been frozen or discouraged by the Government the past 2 years, and current plans reflect some delayed projects. The Bureau of Labor Statistics report on urban building permits shows the following: for the first 9 months of 1952, 2,752 permits for $34,794,000 against 2,444 for $27,831,000 in the corresponding 1951 period. This is a 12.6 per cent increase by number and 24.9 per cent by value.

Refining . . . This division seems to be in for substantial expenditures this year. This is due to the construction of more expensive processing facilities as well as work to increase basic crude capacity.

PAD data indicate 385,000 bbl. daily will be added this year in crude capacity against 412,000 last year, 307,000 bbl. daily in catalytic cracking against 200,000 last year, and 136,000 catalytic reforming against 65,000 last year. These are round figures, but they show the increased construction of the more elaborate units.

The National Constructor Association which includes as members the country's major refining and petrochemical contracting companies, believes that operations will continue at a high level at least the next 6 months. The volume of industrial engineering and construction is expected to be lower during the third and fourth quarters, but this is viewed as a decrease of moderate proportions. During October, more than 58,000 men were at work on member-company projects, com-

pared to a pre-Korean postwar high in May 1948 of 52,612.

Another study showing high petroleum-industry expenditures is the joint report of the Commerce Department and the SEC on plant and equipment expenditures. This shows a classification under the nondurable goods industries of petroleum and coal products. This is obviously made up mostly of petroleum refining and associated operations. This lists 1951 expenditures, $2,014,000,000; 1952, $2,494,000,000, and 1953, $2,651,000,000. The increase is 6 per cent from 1952 to 1953. This is all classes of expenditures, and while not strictly comparable to the figures shown for refining capital outlay, it does point up the trend.

Most companies optimistic . . . The Oil and Gas Journal's survey of the individual oil companies, both major integrated and independent integrated, shows that the feeling for 1953 is optimistic. In general, the figures are slightly above the previous record-breaking year of 1952, as concerns money budgeted for capital expenditures.

Here are what some of the country's oil company leaders told the Journal, for 1953:

"I can tell you that we are reasonably optimistic about the oil industry outlook for 1953, and insofar as our present plans go, we anticipate spending just as much, or more money, in all of our important activities in 1953 as we did in 1952. In other words, if business is going to be good, we propose to keep up with it."

"Our total domestic capital outlay for 1953, including exploratory costs, calls for an expenditure of more . . . about 15.8 per cent more . . . than the indicated comparable expenditures for 1952. Most of the increases are applicable to our refining and pipe-line departments."

"Our proposed expenditures for 1953 are again contingent on the availability of materials. The drilling program includes wells required for normal field development plus a somewhat smaller wildcat program. Expenditures for gasoline and cycling plants include necessary expansion of existing facilities in line with increased operations, plus new plants required by recent developments."

"This total . . . is 82.8 per cent more . . . in comparison with total actual expenditures for 1952. The major increase for 1953 is occasioned by refinery expansion. In addition, the 1953 budget contemplates charges to expense for lease rentals and exploration work . . . of $1,000,000 more . . . in comparison than what was spent in 1952."

"Using our first-half 1953 budget and the current estimate of our second-half 1953 budget, the following tabulation shows the percentage changes: drilling (exploratory and development), —10 per cent; producing (plant and equipment), —13 per cent."

"Budgets based on indications of a period of general business activity at about the present level, and in petroleum business at increasing volumes and approximately current price levels through most of 1953."

"We are endeavoring to cut expenditures below last year's figure, but just what they will be for the different departments it is impossible to say at this time."

"All of the allocations to the different divisions, in general, will necessarily be predicated on the amount of material available, about which we hope to have better information by the first of February."

"We spend it as developments require it. Plans about same as last year."

"A new high record level was reached in our company for its capital expenditures for 1952. Of these expenditures, slightly more than 60 per cent covered the acquisition of prospective oil and gas lands, the drilling of exploratory and development wells, and the installation of related field facilities, such as natural-gasoline plants. Approximately 30 per cent of the expenditures related to our company's construction program of its refineries. The remainder was segregated more or less equally between transportation and marketing facilities.

"For 1953 it appears total capital expenditures will be somewhat less than the high level for 1952. However, this does not reflect any curtailment in the exploration and oil development program, as we anticipate such expenditures will probably exceed the 1952 level. Except for delayed charges and a minor portion of as yet unfinished construction, the current refinery expansion program is virtually complete with the result expenditures in this direction will be materially lower in 1953. We expect to substantially increase amounts allocated for new transportation and marketing facilities."

"We plan to carry on in 1953 with a large-scale program of the same general magnitude in 1952."

"Programs and expenditures approximately the same as for year 1952 and geared to meet expected demands for petroleum products."

"Our figure for 1953 total expenditures is 20 per cent up as compared with the capital money spent during 1952. The actual cash outlay during 1952 was substantially less than the approved budget for that year due to the delays in delivery of materials and other interruptions to construction."

"Our 1953 budgeted figures are . . . 8 per cent higher . . . than 1952. They of course are very flexible, and actual expenditures will be geared to operating results as the year progresses."

The Journal's method . . . The Journal's survey is conducted on a strictly confidential basis, and individual budget figures or any identification cannot be given.

The total of the budget figures for the various oil companies is projected to a 100 per cent basis by The Oil and Gas Journal, using appropriate standard index data which are regularly maintained by the Journal's statistical department.

MID-CONTINENT

New Oil Strike

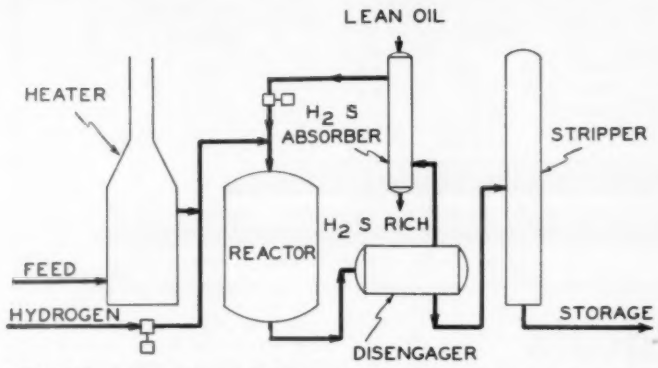
Huber wildcat may extend Greenough field 3 miles

TULSA.—A new oil discovery of possible major significance has been made in northwestern Beaver County in the Oklahoma Panhandle.

J. M. Huber Corp., of Borger, Tex., in its 1 Potter wildcat in C SE NW 26-6n-21eCM, recovered 1,600 ft. of clean oil plus 120 ft. of oil and gas-cut mud in a 30-minute drill-stem test at 5,640-94 ft. in lower Oswego lime. Operators have cemented casing on top of the indicated pay zone and are preparing to complete the well.

Location of the discovery is approximately 3 miles northwest of Carter Oil Co.'s Greenough field, discovered early in 1952, where four producing wells have been completed to date. Pay zone of this field also is lower Oswego lime, and since it has not been defined to the northwest, the Huber discovery could be a 3-mile extension, proving a sizable producing area. Pay in the new discovery is approximately 200 ft. higher than in Greenough field.

The discovery also is only 1½ miles southeast of the steadily expanding Light Ranch gas-distillate field, already spread over an area more than 5 miles long from north to south and more than 3 miles wide. Although the latter field produces from stratigraphically deeper horizons, the Morrow (basal Pennsylvanian) sand and the upper Mississippian, the Huber discovery may prove a connecting link between it and Greenough.



PRINCIPAL STEPS in the new Hydrofiner to be installed at Bayway are shown in this simplified flow diagram. The unit will hydrogenate cracked naphthas and No. 2 burning oil to improve their stability.

Bayway to Modernize

Huge program will involve first commercial installation of Hydrofining unit; over-all residual yields to be cut

George Weber

LINDEN, N. J.—Esso Standard Oil Co. has approved a modernization program for the Bayway refinery, designed to improve both the quality and yield of light and middle-distillate products.

The program covers the construction of a new 60,000-bbl. per day, three-stage crude distillation unit, a Hydrofining unit capable of processing 20,000 bbl. per day of naphthas and light furnace oil, and a high-viscosity fuel burning system which will permit the consumption of heavy residual fuels for power generation and crude heating throughout the refinery.

In combination, the three projects will permit a reduction of the refinery's over-all yield of residual products to about 11 per cent on crude. The new crude unit will supplement an existing 49,000-bbl. per day vacuum still to increase the production of heavy vacuum distillate feed stocks for catalytic cracking.

By substituting high-viscosity fuels for still and boiler-house fuel, the new burner system will release added distillate fuels, including flux oils, to plant product. The Hydrofiner will improve the stability of cracked distillates at higher yields than existing treating methods.

Crude unit . . . A prefractionator, the first at Bayway refinery, will be incorporated in the new crude unit. In this initial stage, crude preheated by exchange with effluent streams will be stripped of light naphtha fractions ahead of the conventional atmospheric and vacuum stages. This prefractionation will improve the separation of narrow-cut light fractions for specialty use.

The new unit will permit the reassignment of facilities presently used in crude service and will provide a net increase of roughly 16,000 bbl. per day in the over-all capacity of the refinery. The contract for its construction has been awarded to M. W. Kellogg Co.

New treating process . . . The Hydrofiner represents a new method for the treating of cracked distillates for stability improvement.

The Bayway unit will be the first commercial application of the process. Originated by the affiliated Standard Oil Development Co., the process provides for catalytic hydrogenation of raw stocks produced by thermal and catalytic cracking.

By obviating the need for acid treating, the new unit will completely eliminate the product losses attending such chemical treating. It will further relieve the company's dependence on sulfuric acid, until recently in critically short supply.

As shown in the accompanying simplified flow diagram, the process operates on the single stage, fixed-bed principle. Outside hydrogen is introduced with the heated feed entering the reactor. The catalytic reactions involve primarily, the straight addition of hydrogen to unsaturated hydrocarbons present in the feed. Some incident desulfurization takes place with the conversion of sulfur compounds to hydrogen sulfide. As a result, the mixed-gas stream taken overhead from the disengager is processed for hydrogen sulfide removal. Hydrogen-rich gas is compressed and recycled to the reactor.

Hydrofiner design . . . The Bayway unit will actually comprise two parallel units for the separate handling of thermal naphthas and full-boiling-range No. 2 burning oil containing both thermal and catalytic cracked stocks. The naphtha unit will be the larger of the two. Stabilized product streams will require, at the most, a light caustic and water wash. Since no polymerization takes place, rerunning is unnecessary.

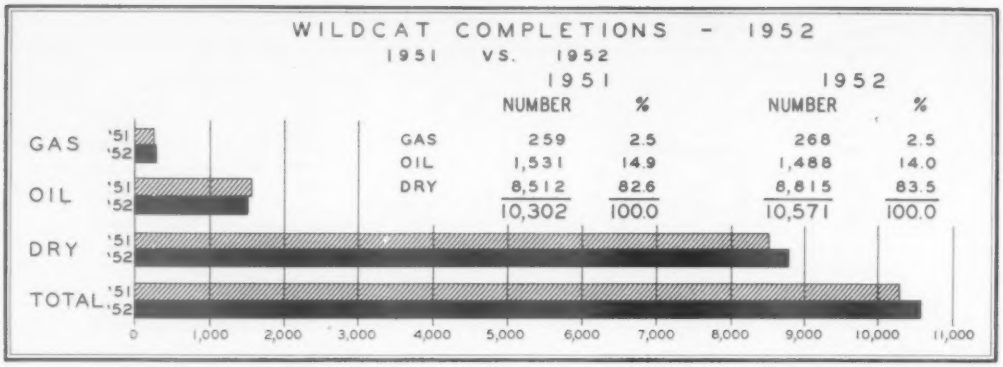
The unit is designed to operate over wide temperature and pressure ranges, determined by the type of feeds, the degree of unsaturation in feed stocks, and the required degree of hydrogenation. The process is classed as a mild form of hydrogenation and does not entail the problems encountered in more severe hydrogenation operations.

The nature of the catalyst was not revealed, but it is said to comprise no precious metals. The coking rate on the catalyst under the operating conditions planned at Bayway is indeterminantly low, and pilot-plant runs show no loss of activity during extended runs. However, provisions will be made for regenerating catalyst if necessary.

The service factor of the Bayway unit will not be controlled by catalyst regeneration requirements, however, as the continuity of the operation will be limited by the supply of hydrogen from Esso's ketone unit located in the refinery.

While the hydrogen-rich tail gas produced in commercial catalytic reforming operations will generally show a lower hydrogen content than the supply available at Bayway, the Hydrofining process is considered operable using such hydrogen streams. This would extend its economic application to a growing number of refineries which will have their own sources of hydrogen from catalytic reforming units.

Construction of both processing units will be started this spring. No contract has been let for the Hydrofiner. Completion of the program is scheduled for 1954.



Record in Wildcats

December completions were down slightly from November, but operators still finished 1952 with an all-time record

John C. McCaslin

WILDCAT completions in December were down slightly from November, but there were enough to set a new all-time record for 1952.

The industry entered the last month of the year needing 583 completions to tie the 1951 record of 10,302. When it ended, operators counted up 852 completions, bringing the 1952 total to a record 10,571.

(For a summary and analysis of wildcat activity throughout 1952, see page 196. For the Journal's annual drilling forecast, turn to page 190).

Of December's 852 completions, 102 were oil discoveries, 25 found gas, and 725 were dry holes. Footage drilled in December totaled 3,986,018 ft., slightly under November's total.

Rocky Mountains . . . Two December completions established the first commercial production west of East Poplar field. The two wells, both in western Roosevelt County, Montana, also marked the most northwesterly production within the Montana portion of the Williston basin.

Continental Oil Co.'s 1 Fast, north of Wolf Point Dome, was completed for an initial of 185 bbl. of oil per day from the Mission Canyon.

In the West Poplar area, Ajax Oil Co. completed its 1 McGowan, a Charles discovery with indicated production of 75 bbl. per day.

Manitoba-North Dakota . . . Manitoba chalked up another discovery during the month on the northeastern edge of the Williston basin. Royalite Oil Co. and Triad Oil Co.'s 1 Lulu Lake, 3 miles north of the Bottineau-Rolletie county line of North Dakota found oil in the Mississippian at about 3,300 ft. and was waiting on pumping equipment.

This wildcat is 35 miles east of the recent Pascar Oil, Ltd., wildcat which made 75 bbl. of oil daily from the Madison.

In Bottineau County, North Dakota, Ward Williston Drilling Co. found oil on a drill-stem test of the Madison in his Turtle Mountain area wildcat, the third test in this area to find oil in the Madison. This test, the 1 Klokstad, is 15 miles northeast of the Zack Brooks and Crawford Smith wildcat which found oil in the Charles and on which testing is continuing.

Also in the Turtle Mountain area Ray Murry and M. B. Monson have logged oil shows at their wildcat northeast of the Zack Brooks apparent discovery.

Previous exploration in this part of the basin had never been rewarded even by shows until the current apparently small but possible commercial recoveries in Bottineau County.

Texas . . . Operators finished 361 wildcats in December to bring the year's total to 4,851, including 823 oil discoveries, 126 new gas wells, and 3,902 dry holes. Exploratory footage drilled in the state totaled over 23 million feet.

One of the most active exploratory years in some time drew to a close in the Texas Panhandle with development of the area's new Quinduno field continuing at a steady pace. This field, opened earlier in the year by Gulf Oil Corp., is the most significant new de-

WILDCATS—1952

	1952		1951	
	Total completions	Total footage (1,000 ft.)	Total completions	Total footage (1,000 ft.)
Kansas	845	3,292	1,006	3,660
Oklahoma	730	3,452	830	3,523
Texas	4,851	23,445	4,408	21,130
North Central	2,083	7,063	1,881	6,337
West	870	5,211	844	5,328
Panhandle	80	482	36	240
East	252	1,369	255	1,176
Gulf Coast	726	5,434	662	4,637
Southwest	840	3,886	730	3,412
Louisiana	401	3,398	379	2,937
North	195	1,161	210	1,131
South	206	2,237	169	1,806
Mississippi	182	1,327	174	1,274
Arkansas	97	427	99	404
Nebraska	187	795	134	637
Rocky Mountains	566	2,942	366	1,764
Dakotas	50	302	13	68
New Mexico	165	1,101	105	615
California	597	2,772	551	2,306
Tri-states	1,386	2,931	1,725	3,760
Others	514	1,504	512	1,491
Total U. S.	10,571	47,688	10,302	43,569

WILDCAT COMPLETIONS—DECEMBER

	Total	Oil	Gas	Dry	Footage
Kansas	73	3	2	68	287,050
Oklahoma	68	6	0	62	324,655
Texas	361	51	13	297	1,908,444
North Central	135	23	1	111	463,505
West	71	15	1	55	474,171
Panhandle	9	1	0	8	42,928
East	20	1	0	19	117,835
Gulf Coast	69	9	6	54	525,703
Southwest	57	2	5	50	284,302
Louisiana	26	1	1	24	198,593
North	13	0	0	13	75,290
South	13	1	1	11	123,303
Mississippi	12	2	0	10	85,986
Arkansas	8	1	0	7	34,747
Nebraska	9	1	2	6	45,199
Rocky Mountains	61	8	2	51	342,384
Dakotas	8	0	0	8	31,723
New Mexico	10	1	2	7	70,568
California	50	3	1	46	237,948
Tri-states	130	21	2	107	283,132
Others	36	4	0	32	
Total December 1952	852	102	25	725	3,986,018
Total November 1952	873	110	18	745	4,027,232
Total December 1951	931	145	25	761	4,228,061
Cumulative 1952	10,571	1,488	268	8,815	47,688,040
Cumulative 1951	10,302	1,531	259	8,512	43,569,443

velopment in the Panhandle area, although a program of flank and fill-in development is moving at a good pace in other parts of the huge Panhandle field area. Most activity in the Panhandle is in Carson, Hutchinson, Gray, Roberts, and Wheeler counties.

A new indicated producer for the highly successful Quinduno field is Gulf's 8 John Haggard, north offset to the discovery well in Roberts County, northwest of Miami.

In West Texas, discoveries of the month included Wilshire Oil Co.'s 1-12 Timmins, an extension test off the southern top of Pegasus field in Upton County, which found the Ellenburger barren but plugged back to make a good well in the Wolfcamp.

In Andrews County Magutex-Ellenburger field received two confirmation tests at Magnolia's north and south offsets. Both wells made good commercial production in the Ellenburger, although each had less pay section than the discovery, but only the south well had good production in the Devonian, as did the discovery well of the field.

Northwest of Magutex field, Phillips Petroleum Co. 1-CC University completed for 2,310 bbl. of oil per day from the Devonian, to open a new field or provide a long extension to Magutex pool.

Canyon reef production came in for its share in new oil, after many months of being overshadowed by deeper drilling. Humble Oil & Refining Co. 1 Riley failed to find Devonian east of North Riley field in southwest Gaines County, but completed as a reef discovery for 611 bbl. of oil a day natural.

Southeast of Vealmoor field, Pan American Production Co. and Seaboard Oil Co. 1 Hamlin had discovery reef production and completed for 312 bbl. of oil daily. In Hockley County, Honolulu Oil Corp. and Signal Oil & Gas Co. 1 Matthews completed for a calculated daily flowing potential of 1,670 bbl. of oil, based on an actual 6-hour flow of 417 bbl. of oil. The well had a pay section of 120 ft., and although located just 2 miles southwest of Ropes-Pennsylvanian field, was expected to prove up a new reef structure.

Big Gas Deal Pending

NEW YORK.—Colorado Oil & Gas Corp. has conditionally agreed to assign its natural-gas reserves in San Juan basin to Pacific Northwest Pipeline Co.

This was announced here last week by Colorado Interstate Gas Co., which owns Colorado Oil & Gas. The reserves are estimated at 464 billion cubic feet, Colorado Interstate said.

The deal is contingent on Pacific Northwest's obtaining Federal Power Commission approval for its projected gas line from the San Juan basin to the Washington-Oregon area, and also on arrangement of adequate financing for the project.

In turn, Pacific Northwest Pipeline has agreed to sell Colorado Interstate 100 million cubic feet daily over a 20-year period if its line is approved. The gas would be delivered near Rock Springs, Wyo., and Colorado Interstate would build a new line to its Colorado markets. FPC will open a hearing on the Pacific Northwest project February 16.

Pipe-Line Advice

Contractors at annual meeting told to bone up on state laws, improve relations with owners of land they cross

Paul Reed

HOUSTON.—With another big construction year ahead, members of the Pipe Line Contractors Association discussed ways of improving their operations at their fifth annual convention last week held here at the Shamrock Hotel.

Special attention was given to the standardization of welding practices, the preparation of a code for high-pressure gas piping, safety measures, and the obstacles that may be encountered in diverse state laws and regulations.

Safety code . . . Efforts toward preparation of a safety code for high-pressure gas piping were described by Walter H. Davidson, general superintendent of Transcontinental Gas Pipeline Corp., Houston.

The committee of 64 now working on the new code, he said, includes representatives of gas-transmission and distribution companies, manufacturers, engineering organizations, college professors, contractors, public-service corporations, the Federal Power Commission, insurance companies, the Bureau of Mines, Bureau of Standards, and the American Petroleum Institute.

Four meetings have been held to discuss the new proposed pressure piping code, he said. The importance of mandatory proof testing was stressed by Davidson.

State laws . . . The importance to contractors of an understanding of state laws and regulations affecting pipe-line contractors was emphasized by Richard A. Gump, executive secretary of the association.

"Application of the National Labor Relations Act to a particular case is determined by whether or not a labor dispute, if one should occur, would tend to burden, obstruct, or in general, affect interstate commerce," Gump said.

"If it would, then the statute applies

NEW OFFICERS and some of the directors of the Pipe Line Contractors Association are, seated left to right, Harold C. Price, outgoing director; Clark C. Bledsoe, treasurer; James P. Neill, vice president; Robert A. Conyes, retiring president; R. H. Fulton, director; and T. A. Hester, director; standing are Robert D. Sheehan, director; Felix M. Johnson, director; Robert Thomas, new president; Ray L. Smith, outgoing director; J. C. Britton, director; and Richard A. Gump, executive secretary. For company affiliations of new officers and for directors not shown here, see story.

and the National Labor Relations Board has authority to act in the case."

"Often," Gump said, "the operation of state labor-relations statutes intersects that of the National Labor Relations Act, and both may conceivably be applied to the same business; the national act because the operations affect interstate commerce and the state act because it happens to be located within the state.

"The United States Supreme Court has held that the state acts covering questions not dealt with by the national act may be applied to interstate business, but where the state act's operation is inconsistent with that of the national act, the state act cannot be applied in an industry over which the NLRB has generally asserted its own jurisdiction," Gump said.

"States have passed statutes regulating not only the use of labor techniques," he said, "but also the objectives of labor organizations. A number of states have passed statutes prohibiting all forms of compulsory unionism.

"We find that 11 states have enacted state labor-relations acts similar to the National Labor Relations Act. These states are Colorado, Connecticut, Kansas, Massachusetts, Michigan, Minnesota, New York, Pennsylvania, Rhode Island, Utah, and Wisconsin. Twenty-six states have enacted legislation placing limitations on the legality of closed shop and union security limitations."

Gump told the contractors that a booklet summarizing state regulations and taxes affecting general contractors is prepared yearly by the Bureau of Contract Information, Inc., Washington, and that the booklet probably would be obtained through any bonding company.

Public relations . . . Charles A. Lingo, vice president of Tennessee Gas Transmission Corp., Houston, said that in transmission operations it is highly important to gain and maintain the good will of landowners and tenants.

The land agents assigned to spreads, due to their previous contacts with the landowner or tenant, are in the best position to handle complaints and settle complaints and should be used, Lingo said.

After the line is in the ground and the ditch has been backfilled, he said, the remaining chores should be accomplished promptly.

"Complete the cleanup and rebuild the fences in the presence of the landowner or his representative in order that any suggestion or complaint . . . can be handled at that time," Lingo advised.

"Leave the premises in as neat a condition as is possible and his fences in a state of repair as good if not better than they were before you entered. Restore private roads you might have used; repair bridges or culverts your heavy equipment might have damaged. Do these things immediately after backfilling the ditch in order that the landowner may resume his operations which might have been halted by the presence of your equipment and work."

Labor note . . . Limitation of labor output is contrary to sound economic efforts according to James F. Lincoln, Lincoln Electric Co., Cleveland. He pointed out that reduction in cost of making welding electrodes, due to higher output, had resulted in prices to the consumer that are lower than those prior to World War II.

New officers . . . Robert Thomas, of Texas - Louisiana Contractors, Fort Worth, was elected president of the association to succeed Robert A. Conyes, Conyes Construction Corp., San Pablo, Calif.

Other new officers are James P. Neill, Western Pipe Line Constructors, Inc., Austin, Tex., vice president; Clark C. Bledsoe, Midwestern Constructors, Inc., Tulsa, treasurer; and Richard A. Gump, Dallas, executive secretary.

Directors elected include Earl Allen, Associated Pipe Line Contractors, Inc., Houston; G. A. Manuel, Williams-Austin Co., Pittsburgh; J. C. Britton, Britton Contracting Co., Inc., Washington, Pa.; T. A. Hester, Oklahoma Pipe Line Constructors, Dallas; R. H. Fulton, R. H. Fulton & Co., Lubbock, Tex.; J. E. Honey, Latex Construction Co., Atlanta; C. C. Bledsoe, Midwestern Constructors, Inc., Tulsa; Robert D. Sheehan, Sheehan Pipe Line Construction Co., Tulsa; R. P. Gregory, Houston Contracting Co., Houston; Felix M. Johnson, Trojan Construction Co., Inc., Oklahoma City; and Richard A. Gump, Dallas, executive secretary.

Hull honored . . . Burt E. Hull, former president of Texas Pipe Line Co. and Trans Arabian Pipe Line Co. and general manager of War Emergency Pipelines, Inc., was honored at the annual banquet.

Hull was presented a plaque in recognition of his services to the pipe-line industry. Hull is now vice president of West Coast Pipe Line Co.

Big Refinery Planned

Shell now awaiting changes in Washington's land laws

OLYMPIA, Wash.—Shell Oil Co. is planning construction of a 50,000-bbl. refinery in the Puget Sound area, provided that Washington clarifies its land laws.

Disclosure of Shell's plans came as the Washington legislature convened, in an announcement that amendments to the land laws would soon be introduced.

Preliminary consideration of the refinery ran into the legal question of whether Shell, as a unit of the Royal Dutch-Shell Group, would be able to own the necessary land under Washington law. The land laws in question had their origin in the anti-Japanese movement of the 1920's and were not aimed at industrial groups such as Shell. Shell attorneys, however, feel that clarification is needed in order to justify the huge investment required by a major refinery.

Shell for many years has been considering the possibility of building a refinery in the Pacific Northwest. The project heretofore has hinged largely on a supply of crude oil, but this is now assured by the oil discoveries in western Canada and the now-building Trans Mountain Pipe Line. Shell Oil Co. of Canada, Ltd., is one of the six large oil companies building the line and owns 130,000 of the 800,000 shares in Trans Mountain.

Shell is not expected to select a site for the refinery or to announce any design plans until the land laws are clarified. It is understood that two steps are necessary, one a change in the Washington statutes and, secondly, an amendment to the state constitution which contains a provision on alien land ownership. The latter would necessitate a referendum.

Shell feels that now that the matter has been presented to Washington officials, the next move is up to the legislature and the people of Washington. So far editorial comment and public reception has been favorable to the company needs.

Deep Test Again Drilling

BAKERSFIELD.—The Ohio Oil Co.'s deep test in the Paloma field is drilling ahead after spending almost 2 months on a fishing job. Now below 16,678 ft. the test, 72-4 K.C.L., ranks as the deepest ever drilled in San Joaquin Valley and fourth deepest in the state. It may drill below 20,000 or 22,000 ft. in exploring lower Miocene and Eocene possibilities.

At nearby North Coles Levee, Richfield Oil Corp. 67-29 C.L.A. was nearing 10,000 ft. Also scheduled to test deep possibilities, the well's casing program so far is 1,122 ft. of 20 in. and 6,511 ft. of 11¾-in. pipe.

Drilling to Rise

Californians plan for 525 field wells in first quarter

LOS ANGELES.—California development drilling during the first quarter will be at the level being maintained before shortage of steel curtailed drilling last summer.

Activity during the first 3 months will exceed that of a year ago by about 15 wells per month, the quarterly drilling forecast of the California Conservation Committee showed. Approximately 30 more field wells will be drilled monthly than in the last quarter of 1952.

As filed with the Conservation Committee, operators expect to drill a total of 461 development wells this quarter. Allowing for wells which were not planned at the time the survey was prepared, the total probably will approximate 525.

The increased activity will largely occur in San Joaquin Valley. Most active fields there will be Buena Vista Hills, Coalinga, Midway-Sunset, and Tejon Hills.

In the Coastal region, Ventura Avenue, with about seven completions monthly; and the new Oakridge field, four completions monthly, will be the most active. Of the Los Angeles basin total, Wilmington and Huntington Beach will account for almost one-half of the development drilling.

San Ardo Drilling Haulted

LOS ANGELES.—The San Ardo field, where about 250 producers have been completed since it was given a pipe-line outlet in mid-1951, last week was without a single drilling well.

Principally a two-company field, General Petroleum Corp. and The Texas Co., San Ardo now contains about 340 producers. Both companies plan further drilling but because the field's 8-in., 25,000-bbl. line has reached capacity further development has been suspended pending its capacity again being increased.

Pipe Plea Denied

PAD says more steel is no cure for Coast oil enigma

WASHINGTON.—Allocation of additional tubular goods to encourage drilling in California would not increase activity in that state nor be in conformity with its policies for the equitable distribution of supplies, in the opinion of officials of the Petroleum Administration for Defense.

Furthermore, it was declared by Deputy Petroleum Administrator J. Ed Warren in rejecting an appeal for more pipe from the Oil Producers Agency of California, a special allowance for operators in that state would place PAD in the position of dictating where tubular goods should be used.

PAD fully recognizes the shortage of crude and products in California and has officially advised other interested government agencies to that effect, Warren said in a letter to D. T. Staples, president of the producer group.

Biggest factor . . . One of the impediments to adequate supplies is a matter of economics, and the Office of Price Stabilization has been advised of PAD's support of applications for increased ceilings, Warren added. But, while there is no doubt that increased drilling in California is desirable, if not essential, "we believe that whatever advantages there may be to an increased allocation of oil-country tubular goods to the geopgraphical area of California are more than offset by other greater countervailing factors," he said.

California operators are receiving the same proportion of the available tubular goods which they used in the pre-Korean period as are operators in other areas, but the decline is drilling last year in relation to the rest of the country results from the fact that "operators who conduct oil operations in California and also in other areas are using their allocations to a greater extent outside the state of California," Warren maintained.

"This conclusion," he said, "is fortified by the fact that we have received but few applications from California operators for conversion steel, the average being much lower than in the rest of the country. If steel—not price—were a primary factor, then we assume that there would be a greater quantity of applications for conversion steel from your area."

Ike's Oil Problems

Cartel case and tidelands issue are two hottest potatoes dropped in Republicans' lap by Truman; Congress critical

Bertram F. Linz

WASHINGTON.—President Dwight D. Eisenhower took office last week facing two major oil problems which the outgoing Truman administration had made political hot potatoes.

The cartel case and the tidelands issue were tossed into the Republicans' laps in such form that no matter what they did they would be damned by a considerable and vocal segment of the public.

But there were indications that if Truman thought he could change Republican policies he was mistaken. Leaders of the party indicated they would go through with their plan to return the tidelands to the states and are expected to at least suspend the cartel investigation pending a further study of the course to be followed.

The cartel case was handed over to the new administration in a form designed to relieve the outgoing President from responsibility. Truman instructed the Department of Justice to drop the grand jury investigation provided the oil companies not only fulfilled the requirements of the long-fought subpoenas but agreed to accept civil suits—conditions which he must have known the companies could not accept. An order by District Judge James R. Kirkland has suspended the proceedings until January 28 to give the new administration an opportunity to review the matter.

Slap at oil . . . In the matter of the tidelands, however, Truman went about as far as he could to embarrass his successor. He declared the entire tidelands area a naval petroleum reserve and issued a statement inferring the domestic oil industry has fallen down on the job of producing enough to meet demand and vigorously opposing the idea of their return to the states.

Calling his action "an important step in the interest of the national defense," Truman declared that "in view of the great demand for oil by the government for defense purposes, it is of the utmost importance that the vast oil deposits in the Continental Shelf, which are assets of all the people of the United States, be conserved and utilized for the national security."

The President pointed out that domestic consumption of petroleum products last year averaged about 7,300,000 bbl. per day while domestic production averaged about 6,800,000 bbl. The balance was met by imports, which he inferred were necessary because of the inability of domestic producers to meet the demand.

"It will be seen," Truman asserted, "that the production of petroleum in the United States during 1952 fell far short of meeting the consumption of petroleum products. This deficit is expected to grow larger year by year."

The President said there are 22 known oil fields adjacent to the coasts of California, Louisiana, and Texas with estimated proven reserves of approximately 492,000,000 bbl. but that actually a grand total of about 15,000,000,000 bbl. underlies the Continental Shelf adjacent to those three states.

"In order that these great reservoirs of oil, which belong to all the people of the United States and are of such crucial importance from the standpoint of the national security, may be preserved for the nation, I have set them aside as a naval petroleum reserve," he said.

"It has been, and still is, my firm conviction that it would be the height of folly for the United States to give away the vast quantities of oil contained in the Continental Shelf, and then buy back this same oil at stiff prices for use of the Army, the Navy, and the Air Force in the defense of the nation."

The President said his executive order would not require the shutdown of any existing production of oil from the submerged lands and that the funds which have been and are being secured from such operations would be held in escrow until Congress determines their disposition.

Truman's order brought quick reaction from the Capitol, where it was described as "outrageous," "an illegal power grab" and "personal spite." Democrats joined with Republicans in their criticism and in predictions that the order would not stand and the tidelands would be restored to the states, as promised.

What can be done . . . Two courses are open to the new administration to meet the situation. President Eisenhower can revoke the order as simply as Truman issued it, or he can ignore the order and let Congress wipe it out with new legislation.

Introduction of measures to rescind the reservation was immediately promised by members of Congress, who expressed confidence Truman's action would not succeed in blocking quitclaim legislation although they admitted that some supporters of the states' claims might switch their position to avoid charges they were hampering national defense.

Although Truman's action was acclaimed in quarters which have been fighting for federal control, they, rather than the Republicans, appeared to be on the defensive, finding it difficult to explain why he had waited years only to act in his last week in office.

While cartel and tidelands are the major oil issues facing the administration at the moment, others are destined to arise in the near future. Prominent

Lubes for Atomic Engines

This gamma radiation unit is now being used by California Research Corp. to test the effects of irradiation on lubricants and other materials likely to be exposed to radioactivity in an atomic engine. The radioactive "source," a 14-in. section of 2-in. cobalt tubing, is housed vertically in the 2-ton, drum-shaped, lead shield. Here an operator removes the "plug" by remote control before inserting test material to be exposed. Door at right normally remains closed.

among these will be the government's suits for recovery of alleged overcharges on oil financed by the Economic Cooperation Administration and Mutual Security Agency and the question of price controls on oil.

All four matters can be turned into political issues if the Democrats so elect.

New PAD Heads Named

WASHINGTON. — Three divisions of the Petroleum Administration for Defense will go under new management February 1, when their present heads complete their terms of service and return to private industry.

R. Rea Jackson of the Socony-Vacuum Oil Co.'s manufacturing committee, New York, has been named deputy director of the refining division and will take over the directorship from William W. Keeler.

Richard E. Nelson, Jr., general manager of crude-oil supply and products pipe lines for Standard Oil Co. (Ind.), Chicago, has been appointed deputy director of the supply and transportation division, preparatory to succeeding Charles E. Spahr.

Paul E. Kuhl, assistant general manager of manufacturing for Esso Standard Oil Co., New York, has become deputy director of the foreign refining division succeeding W. Vaughn Ischie.

OPS Permits Lube-Price Hike

WASHINGTON. — Producers, distributors, and jobbers of lubricating oils, greases, and waxes have been authorized by the Office of Price Stabilization to increase their prices to reflect increased transportation costs resulting from rate advances since May 15, 1951.

By Amendment 2 to CPR 63, effective January 20, the former cutoff date of May 15, 1951, has been eliminated, and increases in transportation costs since that date may now be passed along to customers.

In line with general OPS policy the amendment permits ceilings to reflect higher outbound freight costs, except on shipments of crude stocks, but in addition compounders, blenders, and refiners are authorized to pass through inbound transportation costs other than those incurred in shipping crude or semi-finished stocks between units or controlled subsidiaries of the same company.

Officials estimated the result of the amendment will be an increase of 1½ to 2 per cent in selling prices.

Conflict on Ceilings

OPS head, retiring interior secretary express opposite views on whether price controls on oil should be removed

WASHINGTON. — The question of whether price controls should be removed on petroleum and its products brought conflicting views from two government officials last week.

Joseph H. Freehill, director of price stabilization, said that prices would rise "several hundred million dollars" if controls were removed at this time, while retiring Interior Secretary Oscar L. Chapman said that decontrol, while resulting in local competitive adjustments, "would not have a general inflationary effect on the economy."

The conflicting views were made known just 4 days in advance of the change in administration, which is expected to bring quick termination of the controls by President Eisenhower.

Chapman disclosed his views in a letter to Russell B. Brown, general counsel of the Independent Petroleum Association of America.

Freehill reported that annual sales of petroleum products amount to $8,000,000,000 a year, with another $2,000,000,000 in sales of natural gas and its liquids, natural gasoline and its products, and liquefied petroleum gases, and $433,000,000 in oil-field machinery and related equipment.

Ceilings high . . . "Ceiling prices on petroleum and petroleum products have been maintained generally at the highest levels prevailing at the time of the price freeze in January 1951," Freehill said in a memorandum to Stabilization Administrator Michael V. DiSalle.

"Costs in the meantime have been mounting, so that producers in several areas are seeking higher ceilings. These areas include the Pacific Coast, Appalachian-Ohio, Texas-Louisiana, Mid-Continent, and Rocky Mountain. With respect to petroleum products, increases in ceiling prices were granted to East Coast suppliers on heating oil. However, there is still pressure on distributor ceilings in this area. Increased ceilings are being asked for generally on the Pacific Coast.

"Ceilings on natural gas likewise are the currant or contract prices existing at the time of the freeze.

"It would be logical to expect that if price controls were removed these industries would try to obtain the increases they have asked for."

Chapman disagrees . . . Chapman's views were given in response to a letter from Brown arguing that price decontrol is necessary to accomplish adequate productive capacity to meet defense requirements.

The secretary made it clear he could not urge decontrol action upon another agency, pointing out that the Petroleum Administration for Defense is limited to responsibility for supply and its strength in its government-industry relationship "has been dependent upon the confidence of both government and industry in its objective approach to petroleum supply problems."

Chapman denied that any of the incentives provided for expansion of production of PAD's allocation or other activities have benefited any segment of the industry above others.

"I am aware that there are now positive indications that the tempo to expand has slackened during the past few months not only in production but in all other branches of the industry except natural gas," Chapman wrote. "This is a consequence of the increased facility capacity that has been created. As capacity increases and becomes more than adequate to meet demand, there is a depressing reaction against inflation. For that reason, I believe that the decontrol of petroleum prices and products would result in local competitive adjustments but would not have a general inflationary effect on the economy.

"We have not made new goal determinations because they must be based upon certain criticality assumptions, and the defense policy determined by the new administration will necessarily have great influence in establishing any new goals," Chapman pointed out. "It would not be helpful to either the Government or industry to establish new goals that will be modified or changed shortly after they are established."

FTC Hits Indiana Standard

WASHINGTON. — A new order against Standard Oil Co. (Ind.) designed to get around the Supreme Court decision making "good faith" an adequate defense against charges of price discrimination was issued last week by the Federal Trade Commission.

The commission's order prohibits the selling of gasoline of like grade and quality (1) to one retailer at a price lower than the price charged competing retailers, and (2) to a retailer at a

WATCHING WASHINGTON

Bertram F. Linz

Jobber Problem

Demands by jobbers for greater representation on the National Petroleum Council may have to be settled by new Secretary of the Interior Douglas McKay.

Although the matters coming before the council rarely go into the competitive field of marketing, a half-dozen or so marketing representatives have been given membership in order that every segment of the oil industry may have a voice in its deliberations.

In recent months, the marketers have indicated that they are not satisfied with their representation, although all of the national associations and some organizations covering large areas are members of the council.

Petroleum Administration for Defense officials pointed out that the problems presented to the NPC are matters of supply and future supply —production, refining, transportation, etc.—rather than questions of distribution. They have contended that the 103-member council already is as large as it can be without becoming unwieldy and that in view of their limited interest in the matters coming before it the marketers are adequately represented.

Up-in-the-Air Pricing

The Federal Trade Commission wound up its activities under a Democratic administration with issuance of an order which, if upheld by the courts, would make pricing a catch-as-catch can proposition.

The FTC order, directed to a number of manufacturers of white lead, would ban "price parallelism," that is, the quoting by a seller of the same price as a competitor.

The respondents in the case were ordered to cease from quoting or selling lead pigments "at prices calculated or determined in accordance with a zone delivered price system for the purpose or with the effect of systematically matching the delivered price quotations or the delivered prices of other sellers of lead pigments and thereby preventing purchasers from finding any advantages in price in dealing with one or more sellers against another."

In a dissent to the commission's decision, Republican member Lowell B. Mason asserted the FTC was seeking to enjoin lawful acts along with unlawful acts by barring what he described as "conscious price parallelism" without conspiracy.

Chairman James M. Mead, however, said the commission's power to take the steps it feels necessary to correct evils found to exist in industry cannot be seriously questioned.

"In addition to recognizing the power of the commission to stop any method of competition, even though individually pursued, if it has a dangerous tendency unduly to hinder competition or create a monopoly," Mead asserted, "the courts have also clearly indicated the extent to which the commission may go in an effort to make its orders effective and to prevent evasion. This is the justification for the prohibition in the order against the use by each of the respondents of a zone delivered pricing system where the purpose or effect of its use is to systematically match the delivered prices of competitive sellers."

Completions Surprise DPA

Defense Production Administration experts have expressed some curiosity how the oil industry was able to drill as many wells as it did last year with tubular goods supplies so far below the steel-footage factor worked out by the Petroleum Administration for Defense.

But they made it clear they are not involving themselves in the discussions now going on between PAD and the National Production Authority's steel division regarding the former's estimate of requirements and the steel industry's estimates of productive capacity.

A year or so ago, it was admitted, DPA was concerned over the outlook for oil-country tubular goods but in recent months appears to have gained confidence in the ingenuity of the industry to meet the problem by the use of conversion steel, second-hand goods, and substitutes.

The current discussions, accordingly, are being left to NPA, and the higher program-making agency will not intervene.

price known to be higher than the price at which it is being sold to a competing retailer by a wholesaler-customer who receives a price less than the retailer-customer price.

The commission acted by a 3-to-2 vote with Commissioners Lowell B. Mason and Albert A. Carretta dissenting. The majority held that the company necessarily knew at the time of the passage of the Robinson-Patman Act that its standard for granting tank-car prices on its gasoline was in all substantial respects the same as the standard used by its major competitors, and that it evidently relied upon the position that so long as the pricing method used prior to passage of the act was unchanged it could defend its price discriminations on the ground that its lower prices were granted in good faith to meet equally low prices of its competitors.

Antitrust Immunity Cut Off

WASHINGTON.—Antitrust-law immunity granted by the Department of Justice to 19 oil companies submitting world supply and demand data to the Petroleum Administration for Defense was withdrawn as one of the last acts of Democratic Atty. Gen. James P. McGranery.

His successor, Republican Herbert E. Brownell, will be asked to restore the immunity so that the cooperative arrangement set up in June 1951 can be continued.

The arrangement was made in the form of a voluntary agreement under which PAD and the companies made their successful effort to overcome the effects of the disruption of Iranian supplies. PAD officials are anxious to continue receiving the company data to keep abreast of world developments.

McGranery withdrew the immunity on the ground improvement in world supplies renders the arrangement unnecessary. His letter of withdrawal to retiring Defense Mobilizer Henry H. Fowler brought an immediate request from Fowler for restoration, at the urging of the Defense and Interior departments.

Synthetic Plants Advocated

WASHINGTON. — Immediate construction of "prototype" commercial plants for the production of synthetic liquid fuels was again recommended last week by Oscar L. Chapman in his final report on the subject as Secretary of the Interior.

Admitting that the initial plants may not be profitable enough to attract the

required equity capital from private sources, Chapman proposed that government aid be extended to companies planning synthetic-fuel products.

He conceded that present methods for the production of fuels from oil shale and coal have not been perfected and that improvements undoubtedly will be made in the future. But plants constructed now, he said, would provide a basis for rapid expansion of the processes, aid in conserving petroleum and reduce our dependence on imports, and produce commercial quantities of important chemical products at reasonable prices.

Oil Attack Disavowed

FTC, in "first public statement" on alleged oil cartel, refuses to back Spingarn's try to prolong investigation

WASHINGTON.—The Federal Trade Commission, as an official body, has disavowed Commissioner Stephen J. Spingarn's attack on the oil industry for its opposition to the commission's cartel study.

By a 3-to-2 vote, the commission has made it clear it does not concur in Springarn's opposition to President Truman's recent action offering to terminate the grand jury investigation or his suggestion that the matter be investigated by Congress.

The three members of the commission who refused to support Springarn were Chairman James M. Mead and Albert A. Carretta, both Democrats, and Lowell Mason, Republican. Springarn's only supporter was John Carson, whose nomination for another term on the commission was recently sent to Congress by the President but is not expected to be confirmed.

Responsibility disclaimed . . . The commission majority accepted responsibility only for preparation of the study by its staff. "The commission has neither approved nor disapproved the statements made by the staff in the study," it was explained in a formal statement. "The commission did not publish the study. The commission did not request the Department of Justice to initiate the current legal proceedings against the major oil companies."

Anything Spingarn has said, the statement continued, was in his individual capacity and not for the commission, which has not objected to the White House's action or requested Congress to investigate either the alleged oil cartel or the alleged propaganda campaign by the oil companies.

"In brief," the statement concluded, "this is the first public statement authorized by the FTC relative to this matter. The commission does not question the legal right of any commissioner to express publicly his views. The commission, however, desires to distinguish between the views of an individual commissioner and the official views of the commission, which may be expressed only pursuant to a majority vote of the commission. The commission has not objected to the action of any government agency in connection with this matter."

Spingarn's response to the commission's action was to call another press conference at which he renewed his recommendation for a Congressional investigation to affirm or reject the accuracy of the report and probe the alleged propaganda by the oil companies, which he said apparently had influenced the State and Defense departments to recommend dropping the case.

Little reaction . . . There was little immediate reaction in Congress to the latest developments in the cartel situation, but Sen. Guy M. Gillette of Iowa, leading Democratic spokesman for small business in the Senate, vigorously opposed the idea of dropping the investigation.

Gillette, in a speech on the floor of the Senate, read Truman's letter proposing to drop the criminal proceedings and declared "if that is not compounding a felony I do not know what is."

"It is inconceivable to me that a grand jury proceeding of this significance should be placed on the auction block of politics," Gillette declared.

Fuel-Oil Investigation Set

WASHINGTON.—Democratic Atty. Gen. James P. McGranery passed on to his successor last week at least one antitrust investigation involving the oil industry.

In a final report to President Truman as he prepared to leave office, McGranery said that in addition to 20 grand jury investigations under way or authorized, the Federal Bureau of Investigation is making 73 investigations and 131 preliminary inquiries are in progress, many of them involving "significant" areas in the economy and one of them covering fuel oil.

CANADA

Tide Water Wildcat Hits

REGINA, Sask.—Another discovery for the Williston basin and Saskatchewan last week appeared assured at Tide Water Associated Oil Co. 1 Forget Crown.

The indicated discovery, located in LSD 2, 11-9-7w2 near the town of Forget, tested a Mississippian limestone interval at 3,852-95 ft. With a short drill-stem test the well flowed clean 29.5°-gravity oil at a rate of 150 bbl. per hour.

The well, approximately 50 miles north of the international boundary and 42 miles west of the Manitoba line, is on a portion of the 9,000,000 acres being explored jointly by Tide Water, as operator, and Ohio Oil Co., Atlantic Refining Co., and Columbian Carbon Co. Tide Water owns 30 per cent of the venture.

Tide Water earlier had completed two discovery wells in Saskatchewan, one at Wapella, 40 miles north of the Forget discovery, and the other at Eastend, 325 miles to the west of the Forget well.

The new well at Forget is now being deepened and tested at intervals to determine the full extent of the producing zone.

Refinery to Begin Operation

CALGARY. — Supreme Refineries, Ltd., has scheduled its refinery at Ogden, 4 miles east of here, to return to service on or about February 1. The refinery has been shut down for a short period for minor alterations.

Plans for 1953 call for increasing the Ogden plant from 600 to 1,000 bbl. per stream day. The current project also includes installation of a 750 bbl. per day visbreaking unit. Erection of a cracking plant at the refinery is currently under consideration.

Plant Expansion Launched

SASKATOON, Sack. — Completion of the modernization project under way at the refinery here of Hi-Way Refineries, Ltd., are set for around the middle of 1953.

The project includes new crude-oil facilities which will raise the refinery's capacity to 6,500 bbl. per stream day. This is an increase of 1,500 bbl. daily.

Additional new facilities being installed at Saskatton include a 3,500-bbl. visbreaker, a 2,600-bbl. cat cracker, and a gas-concentration plant.

SOUTHWEST

Allowable Up

Texas February oil output to run 27,829 bbl. higher

AUSTIN.—A slight increase in daily crude-oil production allowables in Texas will be permitted in February.

The Texas Railroad Commission set the February allowable at 3,238,937 bbl. daily—up 27,829 bbl. daily from the January 1 figure of 3,211,108 bbl.

The increase results from the fact that there are 3 fewer days in February. The number of days wells will be permitted to produce during the month was cut to 20 for the state generally and 17 for East Texas from January's 22/19 pattern.

Following the request of Carl Jones, Phillips Petroleum Co. representative, the commission put the 14 fields connected to the company's Goldsmith natural-gasoline plant on a 17-day schedule, compared to 19 days in January. Jones said the plant could not handle 19 days during a 28-day month.

Some ask more . . . Several of the companies favored higher production. Sun Oil Co. nominated for a 21/18 pattern. Joe Owens, Sun representative, said his company continues to have difficulty in finding crude. Magnolia Petroleum Co.'s Fred Moore said Magnolia nominated on 21/18 and still would be forced to draw on stocks even if this figure were adopted. Don Crites, of Shell, said his company favored 21/18 and still would be withdrawing stocks at the rate of 5,000 bbl. daily.

The majority of the remainder of the companies, including Gulf Oil Corp., The Texas Co., and Cities Service Oil Co., favored 20/18.

Humble nominated on a 19/17 basis, while Sinclair suggested 20/17.

Fort Chadbourne field, where Lone Star Gas Co. is building a new natural-gasoline plant, was ordered to remain shut in by the commission. A hearing, however, has been set for January 27 on the possibility of reopening the field.

ALLOWABLES BY DISTRICTS

	Bbl. daily
District 1	44,661
District 2	173,959
District 3	514,798
District 4	277,157
District 5	55,764
District 6	
Outside East Texas	134,257
East Texas field	262,446
District 7B	145,428
District 7C	208,949
District 8	1,059,378
District 9	263,014
District 10	99,024

Minimum Gas Price Pushed

AUSTIN.—A bill providing for minimum field prices for gas produced in Texas' Panhandle - Hugoton field was referred to committee by the state senate here last week.

The bill, introduced by Sen. Grady Hazelwood, Amarillo, would empower the Texas Railroad Commission to fix minimum well-head prices to reduce gas waste in fields producing both sweet and sour gas or those which embrace a surface area of at least 300,000 acres.

Hazelwood contends that gas from the Texas portion of Panhandle is selling for half as much as in Oklahoma and that such low prices result in abandonment of wells before they are completely exhausted, as well as reducing the incentive for operators to drill flank wells. Such an increase in price, he pointed out, also would result in more revenue for the state.

A bill similar to the one introduced by Hazelwood was introduced in the past, met strong opposition, and was defeated.

The new legislature also heard Gov. Allan Shivers suggest levying additional taxes on natural-gas-transmission lines if it is decided to seek additional revenue. Shivers said these taxes should be levied if practical under existing legal circumstances. The controversial gas-gathering tax imposed in September 1951 is still in the courts. With $40,000,000 of anticipated revenue tied up already, the state does not wish to legislate itself into another such situation.

Compressor Tax Proposed

AUSTIN.—A natural-gas compressor tax which would bring in $60 per year for each compressor horsepower used in transmitting natural gas through pipe lines has been proposed to the Texas legislature by Rep. Dolph Briscoe, Uvalde.

Briscoe said his measure would cost little to Texans, for the great bulk of the tax will be paid by people and industries outside of Texas but enjoying the use of the state's natural gas. He said the validity of a compressor tax in Louisiana has been upheld by the Supreme Court.

The new tax bill, if it passes, would raise an estimated $60,000,000 annually, Briscoe said.

ROCKY MOUNTAIN

New Line Assured

Inland says it definitely will lay line to Spokane

SPOKANE.—W. Turner Clack, president of the recently formed Inland Empire Pipeline Co., said last week his company will build its proposed products line from Billings, Mont., to Spokane whether or not Continental Pipe Line Co. lays a similar line.

Clack said, however, that there is no need for two lines and that he hopes the two companies can join forces for the project.

Clack's decision to lay the 600-mile, 8 and 10-in. line, he said, was taken after Continental had run two surveys and, as he understood, had decided not to build. The Inland executive said his company has both the supply and the market for the 15,000 bbl. of crude which the line would carry initially.

Big hydraulic head . . . Route of the Inland line extends from Billings through Bozeman Pass to Helena, Mont., where it crosses the Continental Divide, then to Missoula, Mont., through Lookout Pass and into Spokane. From the Continental Divide, the highest point along the line at 6,300 ft., to the Spokane terminal there is a drop in altitude of 4,300 ft.

The Inland line, he said, would have intermediate terminals at Bozeman, Helena, and Missoula, Mont., and Kellogg, Idaho. Ultimate capacity of the line would be about 26,000 bbl. daily with the addition of pump stations.

The Billings area, Clack said, has a refining capacity of about 45,000 bbl. daily with an exportable surplus of about 15,000 bbl. daily at present. In addition, there is adequate production behind the refineries to increase this surplus substantially, he said.

Equity capital for the project is to be supplied by Clack and a group of associates.

Yellowstone line . . . Continental announced early in November that it was planning an 8-in. line from Billings to Spokane and hoped to begin construction in the near future *(The Oil and Gas Journal, November 10, page 183)*.

This project, to be known as the Yellowstone pipe line, would follow the same route generally and have an ultimate capacity of 25,000 bbl. daily. Continental Oil Co., the parent firm, operates a 6,800-bbl. refinery at Billings.

Exports Increase

But total imports show a drop for November

IMPORTS decreased and exports increased in November, according to data released by the Census Bureau of the Department of Commerce.

Total imports into continental United States averaged 923,000 bbl. daily in November compared with 1,042,000 bbl. daily in October, a drop of 119,000 bbl. daily or 11.4 per cent.

Crude imports were off 87,000 bbl. daily from October, and product imports decreased 32,000 bbl. daily. Compared with November 1951, crude receipts were up 121,000 bbl. daily, but product imports represented a small decrease of 14,000 bbl. daily.

Exports of crude and products, excluding shipments to territories, averaged 387,000 bbl. daily compared with 333,000 bbl. daily in October and 390,000 bbl. daily in the same month a year earlier.

Most of the increase over October was due to larger shipments of crude, gasoline, and distillate fuels. Very little change was reported for kerosine, residual, and other products.

IMPORTS INTO CONTINENTAL UNITED STATES
(Thousands of barrels)

	Nov. 1952	Oct. 1952	Nov. 1951
Crude—			
Mexico	616	470	1,255
Colombia	1,121	1,601	1,510
Venezuela	9,609	10,413	8,544
Kuwait	1,907	2,936	1,036
Saudi Arabia	2,696	3,032	204
Iraq	...	540	...
Canada	63	168	177
Far East	776	905	442
Total crude	16,788	20,065	13,168
Daily average	560	647	439
Products—			
Residual fuel	10,541	11,338	10,682
Other products	364	895	617
Total products	10,905	12,233	11,299
Daily average	363	395	377
Total all oils	27,693	32,298	24,467
Daily average	923	1,042	816

EXPORTS*

	Nov. 1952	Oct. 1952	Nov. 1951
Crude	1,805	1,526	1,858
Gasoline	3,442	2,375	3,846
Kerosine	357	357	484
Distillate fuel	2,932	†2,751	1,184
Residual fuel	1,271	1,372	1,962
Lube oils	961	1,056	1,476
Other products	834	884	875
Total all oils	11,602	10,321	11,685
Daily average	387	333	390

*Excludes shipments to territories. †Revised.

Product Stocks Down

Secondary inventories show decline, but less than 1951

SECONDARY inventories of major petroleum products totaled 55,966,000 bbl. at the end of last November, according to data compiled and released by the Census Bureau of the Department of Commerce.

Stocks were lower at the end of November than at the close of October for each product. The total seasonal reduction in November was 1,692,000 bbl. or 2.9 per cent.

Comparison with data for previous year indicates that the reduction in secondary stocks in November was much smaller than in November 1951 when these stocks were cut 3,015,000 bbl. This lack of reduction is also shown by the fact that stocks at the end of November were 4.4 per cent greater than a year earlier compared with a net increase over the previous year at the end of October of 1.8 per cent.

The increase in distillate-fuel stocks accounted for most of the gain over November 30, 1951. The distillate gain was 1,886,000 bbl. out of a total increase of 2,337,000 bbl. Gasoline and residual stocks were up 292,000 bbl. and 256,000 bbl. respectively. Kerosine stocks were down 97,000 bbl.

SECONDARY STOCKS
(Thousands of barrels)

	Nov. 30, 1952	Oct. 31, 1952	Nov. 30, 1951
Gasoline:			
Dist. 1	5,875	6,253	5,822
Dist. 2	7,902	8,300	8,108
Dist. 3	3,245	2,967	2,917
Dist 4	830	838	868
Dist 5	2,063	2,049	1,908
Total	19,915	20,407	19,623
Kerosine*:			
Dist. 1	3,349	3,485	3,255
Dist. 2	3,664	3,780	3,896
Dist. 3	821	859	757
Dist. 4	93	99	101
Dist. 5	105	112	120
Total	8,032	8,335	8,129
Distillate:			
Dist. 1	11,616	11,940	9,963
Dist. 2	6,795	6,917	6,769
Dist. 3	1,300	1,480	1,280
Dist. 4	493	511	470
Dist. 5	1,304	1,342	1,140
Total	21,508	22,190	19,622
Residual:			
Dist. 1	3,907	4,046	3,884
Dist. 2	1,901	1,825	1,558
Dist. 3	517	665	608
Dist. 4	6	10	6
Dist. 5	180	180	199
Total	6,511	6,726	6,255
Major products:			
Dist. 1	24,746	25,724	22,923
Dist. 2	20,263	20,822	20,332
Dist. 3	5,883	5,971	5,562
Dist. 4	1,442	1,458	1,445
Dist. 5	3,652	3,683	3,367
Total	55,966	57,658	53,629

*Includes range oil.

Demand Increase Seen

CHICAGO.—An increase in domestic demand for 1953 of "4 or 5 per cent" was predicted last week by Dr. Robert E. Wilson, board chairman of Standard Oil Co. (Ind.).

Addressing the Investment Analysts Society of Chicago, Wilson said that in view of the postwar average increase of about 7 per cent a year and the optimistic outlook for 1953 it is obvious that the petroleum industry is still among the most rapidly growing of all major industries.

He was critical of the rigid price ceilings on products, saying that price fluctuations guarantee the movement of products most needed into areas which particularly need them.

Major-Product Exports Dip

WASHINGTON.—Exports of major oil products dropped to an average of 247,100 bbl. daily for the week ended December 26 from 280,900 bbl. daily for the preceding week, according to figures compiled by the Petroleum Administration for Defense.

The drop was due to lower shipments of distillate and residual which more than offset increases in the movement of aviation and motor gasoline and kerosine.

Details of the week's exports, compared with the preceding week, and averages for the 4 weeks ended December 26, are shown in the accompanying table in thousands of barrels daily.

	Week ended— Dec. 26	Dec. 19	Average 4 weeks
Aviation gasoline	47.2	29.7	34.3
Motor gasoline	75.0	67.0	64.2
Kerosine	29.8	20.6	15.6
Distillate	65.2	114.9	88.4
Residual	29.9	48.7	36.1
Total	247.1	280.9	238.6

Production Mark Falls

Output of Free World in November averaged 11,700,000 bbl. daily, bringing world total to nearly 13,000,000

Dahl M. Duff

CRUDE-OIL production of the free world rose to a new record in November when total output reached an average of approximately 11,700,000 bbl. daily.

The new peak in non-Communist production represented a continuation of the small but steady gains that occurred in most of the previous months of 1952. The November free world total was 6.6 per cent above the corresponding month of 1951.

Most of the increase over October was accounted for in the United States. The total was up 135,400 bbl. daily, and of this, nearly 92,000 bbl. daily was due to higher domestic output. During the month, fields in the United States produced about 6,609,000 bbl. daily, a new all-time record. Domestic production was 1.4 per cent above October and 5.4 per cent above November 1951.

Russia and its satellite countries are now believed to be producing crude at a rate of 1,144,000 bbl. daily. Estimated total world production in November thus was running at a rate of 12,844,100 bbl. daily, also a new peak.

Non-Communist foreign production was up nearly 44,000 bbl. daily during the month for an increase of nearly 1 per cent over October. The increase over November 1951 represented a gain of 8.2 per cent. This is generally in line with the anticipated increase expected in foreign crude production during 1953.

Venezuela . . . For the second consecutive month, Venezuelan production climbed. Output in this country dropped sharply during the summer because of surplus conditions in the heavy fuel-oil market. The low was reached in September with an average of 1,717,600 bbl. daily.

The November production of 1,811,000 bbl. daily represented an increase of 50,900 bbl. daily, or 2.9 per cent, over October. However, Venezuelan production was only about 57,000 bbl. daily, or 3.2 per cent, over November 1951.

Daily average production by weeks in Venezuela during November was: week ended November 3, 1,729,100 bbl.; November 10, 1,822,300 bbl.; November 17, 1,838,300 bbl.; November 24, 1,817,000 bbl.; and December 1, 1,800,000 bbl.

Other American . . . Canadian production dropped off 11,000 bbl. daily during the month. The downturn was an expected seasonal development due to the drop in pipe-line deliveries.

Crude production in Colombia was up 3,000 bbl. daily from the low level of October which was reported to have been due to floods and difficulty with pipe-line operations. Production by areas in Colombia during November was: De Mares, 34,715 bbl. daily (2,323 bbl. daily condensate); Barco, 26,827 bbl. daily; Yondo, 34,695 bbl. daily; Cantagallo, 1,162 bbl. daily; Dificil, 1,153 bbl. daily; and Velasquez, 4,810 bbl. daily.

Mexican crude production during November again showed little change. Output in this country has held between 210,000 and 215,000 bbl. daily during most of 1952.

Europe . . . West Germany's crude production during November totaled 155,644 metric tons, an average of 36,800 bbl. daily. It was another small increase over the previous month and another new record high for the country.

The only other significant increase in western Europe was in northern Italy, which averaged around 1,900 bbl. daily. Most of this comes from Cortemaggiore field of the government's Azienda Generale Italiana Petroli. Italian production, though still

WORLD CRUDE-OIL PRODUCTION
(In thousands of barrels daily)

Country—	Nov. 1952	Oct. 1952	Nov. 1951
W. Hemisphere:			
Argentina	71.0	69.0	70.0
Bolivia	1.4	1.3	1.6
Brazil	2.2	2.1	1.4
Canada	187.0	198.0	135.0
Chile	2.9	2.8	2.1
Colombia	103.4	100.4	96.1
Cuba	0.1	0.1	0.1
Ecuador	8.0	8.5	8.2
Mexico	211.6	210.2	210.0
Peru	45.0	45.0	45.4
Trinidad	58.5	58.3	57.6
Venezuela	1,811.0	1,760.1	1,754.2
Total	2,502.1	2,455.8	2,381.7
Europe and Africa:			
France	7.1	7.1	6.3
Algeria	1.7	1.6	0.3
F. Morocco	1.9	1.9	1.5
W. Germany	36.8	35.6	28.8
Italy	1.9	1.8	0.6
Netherlands	13.1	13.2	13.7
Egypt	45.0	46.2	46.1
United Kingdom	1.1	1.1	1.0
Total	108.6	108.5	98.3
Middle East:			
Bahrein	30.2	30.0	30.2
Iran	23.0	23.0	75.0
Iraq	485.3	526.0	177.9
Kuwait	792.4	755.6	705.1
Qatar	79.4	75.5	55.0
Saudi Arabia	764.1	764.9	896.7
Turkey	0.3	0.1	0.5
Total	2,174.7	2,175.1	1,940.4
Other Asia:			
British Borneo	105.0	104.6	103.7
Burma	2.5	2.5	2.0
India	6.0	6.0	5.0
Indonesia	178.0	180.0	160.0
Japan	5.7	6.1	6.0
New Guinea	4.7	4.9	4.9
Pakistan	3.8	3.7	3.2
Total	305.7	307.8	284.8
Total foreign less Russia*	5,091.1	5,047.2	4,705.2
United States	6,609.0	6,517.5	6,271.7
Total free world	11,700.1	11,564.7	10,976.9
Est. Russia:†			
Austria	55.0	55.0	43.0
Romania	80.0	80.0	90.0
Russia	985.0	985.0	860.0
Other Communist	24.0	24.0	24.3
Total	1,144.0	1,144.0	1,017.3
World total	12,844.1	12,708.7	11,994.2

*And other Communist-controlled areas.
†And satellite areas.

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these areas. Completely current reports also are lacking for certain countries of Southeast Asia. Data for earlier months have been revised where necessary.

Other Communist areas comprise Albania, China, Czechoslovakia, Hungary, Poland, and Yugoslavia.

TREND OVER THE LAST YEAR

	Western Hemisphere less U. S.	Middle East	Total foreign less Russia and E. Europe
December	2,404.9	1,846.3	4,633.1
January	2,432.3	1,832.8	4,653.5
February	2,438.8	1,860.1	4,692.0
March	2,437.8	1,996.5	4,813.8
April	2,459.6	2,090.8	4,933.2
May	2,527.6	2,142.1	5,059.9
June	2,517.8	2,208.9	5,117.6
July	2,495.0	2,126.1	5,018.7
August	2,425.5	2,091.7	4,921.7
September	2,417.8	2,168.2	4,994.8
October	2,455.8	2,175.1	5,047.2
November	2,502.1	2,174.7	5,091.1

only a fraction of domestic consumption, rose to more than three times what it was a year earlier.

Middle East . . . Total production of the Middle East showed little change in November. However, the total was some 234,000 bbl. daily above November 1951, a time when the industry was making every effort to overcome the shortage resulting from the cessation of operations in Iran.

Of the three major producing countries, Kuwait's sharp increase was offset by a decline in Iraq, while Saudi Arabia was virtually unchanged from the level of October. Kuwait production was up nearly 37,000 bbl. daily to the highest point since the record of 810,200 bbl. daily for the shaikhdom last July.

On the other hand, production in Iraq, which has been rapidly climbing as a result of the new 30 and 32-in. pipe line to Banias, Syria, dropped back 40,700 bbl. daily. The decrease was in Kirkuk field which produced 394,100 bbl. daily in November against 443,300 bbl. daily the previous month.

In London, a spokesman for Iraq Petroleum Co., Ltd., explained that fluctuations in output are to be expected until all work on the pumping stations on the Banias line is completed. The line is expected to be handling its full design capacity of 14,000,000 tons—about 290,000 bbl. daily—in a few months.

During November, other Iraq production came from Zubair, 59,200 bbl. daily, against 59,100 bbl. daily in October; Ain Zalah, 21,000 bbl. daily against 12,400 bbl. daily in October, and from Khanaqin, which produces around 11,000 bbl. daily.

Production in Qatar rose to 79,400 bbl. daily in November. This was a new high for this area and an increase of about 4,000 bbl. daily over the previous month. Iran is now believed to be producing about 23,000 bbl. daily, an amount limited to what can be absorbed on the domestic market.

MIDDLE EAST

Oil Moves from Iran

Loading of Italian tanker at Abadan may result in first ruling by non-British court on ownership of Iranian oil

ANOTHER small Italian tanker steamed out of Abadan with a cargo of Iranian oil last week, while in Teheran, Prime Minister Mossadegh obtained an extension of the decree powers needed for a possible early settlement of the over-all oil dispute with the British.

The vessel loaded at Abadan was the Miriella. Its charterer, an independent Italian firm, was apparently undaunted by the fact that the only other tanker to attempt oil export from Iran, the Rose Mary, was attached at Aden where a British court subsequently held the cargo was the legal property of Anglo-Iranian Oil Co., Ltd.

The 39-year-old Miriella is owned by the Italian shipping company, Citmar, of Genoa. It was chartered by an Italian oil-importing company of Rome known as Supor and headed by Mario Badoglio, son of the former Italian premier, Marshal Pietro Badoglio. Also involved is Consortio Carbonifero, a coal company of Genoa, which has signed a contract for the purchase of oil, one of 30 said to have been negotiated with foreign interests by the Iranian Government.

Cargo unknown . . . The Mireilla took on a cargo of 5,000 tons, or about 38,000 bbl. January 19 and left for Genoa. The vessel was expected to avoid British territory and keep to the high seas on her return voyage. The cargo is expected to be taken into Genoa under bond and held for transshipment, probably to Poland. The Supor company is reported to have worked out a three-way barter deal involving Iranian oil, Polish coal, and Italian manufactured products. The Italian Government indicated some time ago it will not grant a permit to import Iranian oil into Italy.

Whether the Miriella loaded crude or products was not made clear. The ship is a "dirty" tanker and customarily carries black products such as crude or fuel oil, but her tanks could have been cleaned at Abadan to allow lifting of the more valuable lighter products now in storage at the largely inactive refinery. Several thousand unemployed Iranian workers at the refinery cheered when the tanker tied up and an oil line was put aboard.

With the dispute and the prime issue of compensation still unsettled, the British Government served notice it will support Anglo-Iranian's claim to the oil. The company is expected to file suit at the first port the Miriella enters. If the case is not made moot by a

Los Angeles Nomads Elect Officers

Heading the Los Angeles chapter of Nomads during 1953 will be these men shown here. Left to right, seated, are Bob Craig, National Supply Co., treasurer; John Flanagan, Johnston Testers, Inc., vice president; Jim Hughes, Lane-Wells Co., president; Bill Wilson, Web Wilson Oil Tools, Inc., junior regent and retiring president; and Joe Schlarb, Chiksan Co., sergeant-at-arms. Standing are Ox Morgan, Oil Well Manufacturing Co., deputy sergeant-at-arms; Earle Boggess, Baker Oil Tools, Inc., outgoing senior regent; Jerry Engstrand, Western Geophysical Co., senior regent; Leo Cypher, Baash-Ross Oil Tool Co., assistant treasurer; and Wally Sawdon, executive secretary. Not shown are Bill Sargent, Sargent Engineering Corp., secretary; and Vern Mitchell, Security Engineering Division, assistant secretary.

general settlement in the meantime, it may provide the first test of the question in non-British courts.

The Iranian parliament January 19 voted 59 to 1 to extend for 1 year the powers previously given to Dr. Mossadegh to legislate by decree. The vote was a clear-cut victory for the prime minister and greatly strengthened his hand in the current discussions with U. S. Ambassador Loy W. Henderson over terms for settling the dispute.

Mossadegh wins . . . Whether Dr. Mossadegh had sufficient influence to approve any kind of oil settlement had been questioned. However, the week's events in Teheran indicated his popularity was as great as ever. While the parliament was meeting in special session, a crowd outside in the square chanted "Mossadegh or death," and some of the many messages and scrolls sent to Teheran in his support were signed in blood.

The fanatical Iranian religious leader, Ayatollah Mashani, was defeated in an attempt to block the grant of extraordinary powers. Kashani had been regarded as Dr. Mossadegh's most serious rival. The prime minister earlier had said the decree powers were necessary to successful settlement of the oil issue, and no acceptance of the new terms was expected until the vote in the parliament.

Agreement near? . . . There was considerable optimism in London and Washington that an agreement may be near. American and British diplomats continued to confer in London, and Dr. Mossadegh held further meetings with Henderson. The discussions were a closely guarded secret, and no official disclosure was made of the nature of the likely terms.

In Teheran, a leading pro-government newspaper said the talks had led to a "60 per cent" agreement, and Foreign Minister Fatemi asserted he was "more optimistic than ever before for a solution of the oil question." The Teheran newspaper said it had been agreed that the compensation and counterclaims issue would be referred to an international body consisting of representatives of Iran, Britain, and the World Court.

It also reported that the difficult question of the price which Britain would pay for Iranian oil had been settled at $8 a ton. This works out to around $1.05 a barrel—70 cents under the posted Persian Gulf price. The United States, it was reported, would buy, and pay in advance for the 12,000,000 to 14,000,000 bbl. of products now stored at Abadan. Britain would commit herself to take around 61,000,000 bbl. of crude during 1953 and drop its legal fight against other exports.

ARTIST'S IMPRESSION of the completed Aden refinery (Anglo-Iranian photo).

Aden Start Pending

British getting ready to begin 100,000-bbl. plant

PERSONNEL and materials are now being assembled at Aden for the construction of the new 100,000-bbl. daily refinery of Anglo-Iranian Oil Co., Ltd.

The project, which will cost the equivalent of about $150,000,000, is the largest new refinery job currently under way in the world. Initial processing operations are scheduled to begin the end of next year.

About 300 British and 50 American engineers and technicians are already on the site, and the local labor force is being recruited. Work was recently begun on two camps to house about 10,000 workers, including about 2,000 Europeans. Many of the European staff group are now living on the 9,789-ton liner Dorsetshire which was brought from Britain and anchored off Aden to provide temporary accommodations.

Contracts have been signed with Middle East Bechtel Corp. and the British firm, George Wimpey & Co. for the construction of the refinery. George Wimpey also will build the oil port, an operation involving the dredging of nearly 5,000,000 cubic yards of sand to provide a turning circle and approach channel.

The refinery and tank farms will occupy 270 acres of the peninsula on which little Aden is located. Aden town is about 10 miles to the east. The refinery's facilities will include two atmospheric distillation units complete with stabilizers and caustic treaters, one platforming unit, and a sulfur dioxide extraction unit. The power station will generate 30,000 kw., and the installed capacity of the boiler battery will be 600,000 lb./hr.

The Aden project is a major part of the company's program of replacing the 500,000 bbl. daily of refining capacity lost at Abadan, Iran. The output is designed particularly to meet the requirements of Anglo-Iranian's large bunkering trade at Aden. Near Fremantle in western Australia, the company is commencing work on another new refinery of 60,000 bbl. daily capacity.

Top A.I.O.C. Men in Aden

The three top men of Anglo-Iranian Oil Co., Ltd., in building the company's 100,000-bbl. refinery in Aden will be S. W. Adey, H. L. Ray, and R. Hedley Sheldrake.

S. W. ADEY

Adey, who joined the company in 1923 and whose service includes 14 years at Abadan, is manager of the company's Middle East Division, Refineries Department, and is responsible for superintending the planning, construction, and subsequent commissioning of the new refinery.

Ray, as superintendent of the projects branch, Middle East Division with offices in London, is primarily concerned with the building of the plant. He joined the company 32 years ago and has been engaged in refinery and process engineering work since 1926.

H. L. RAY

R. H. SHELDRAKE

Sheldrake is resident manager of the Aden refinery project. He joined the company in January 1944 after 14 years' engineering experience.

Work to Begin Off Qatar

Shell Overseas Exploration Co., Ltd., expects to begin work in the near future on the offshore concession which the Shell organization obtained earlier this year in Qatar.

Shell has rights over the underwater area beyond the shaikhdom's territorial limits. The company said in London that the agreement calls for 50-50 sharing of profits if commercial production is obtained.

This same area formerly was under concession to a company controlled by Superior Oil Co. *(The Oil and Gas Journal, July 14, page 84.)*

EUROPE

Cut in Runs Planned

Refining operations in Italy at a rate of about 90,000 bbl. daily during the current first quarter are provided in the program prepared by the Italian Ministry of Industry and Commerce. The total represents a decrease from the last quarter of 1952, when the ministry authorized processing at a rate of nearly 100,000 bbl. daily.

The first quarter program calls for the refining of 1,100,000 tons of crude oil against 1,217,000 tons in the final 3 months of 1952. Italy's growing but still relatively minute indigenous crude production is shown by the inclusion in the first quarter 1953 total of 21,000 tons of domestic crude. This equals to about 1,700 bbl. daily.

Italy now has considerable surplus refining capacity in terms of internal Italian consumption of products. With the new 45,000-bbl. Condor plant at Milan in operation, total capacity in the country is nearly 260,000 bbl. daily.

Even completely excluding the Naples refinery of Socony-Vacuum Italiana which is partly an export operation, Italy has some 200,000 bbl. daily total capacity.

Latest available data on domestic consumption are for the first 9 months of 1952, when refinery runs averaged approximately 115,000 bbl. daily. This was an 8 per cent increase over the same period of 1951 but still far below total capacity.

FAR EAST

British Burma to Move

British Burmah Petroleum Co., Ltd., which held properties in the flourishing oil industry operating in Burma before the war, has decided to transfer its management to South Africa where it has substantial interests in torbanite mining companies.

A. P. Faickney, the company chairman, in a recent stockholders statement, pointed out that the company's oil interests in Burma will continue to diminish while the South African side of the business is active and expanding. A local committee will be established to handle administration required in the United Kingdom.

Discussing developments in Burma, Faickney said the negotiations on a plan by which the Burmese Government hoped to buy a share in the now-consolidated Burma oil industry had not progressed during the last year but instead had unquestionably suffered from "upsets and hitches" which make it impossible to say they are approaching finality.

British Burma a year and a half ago closed down its separate Burma organization. The oil interests in Burma of Burmah Oil Co., Ltd., Indo-Burma Petroleum Co., Ltd., and British Burmah Petroleum Co., Ltd., are now merged into an operative partnership managed by Burmah Oil and in which British Burmah holds a 2½ per cent interest.

International Briefs

The wildcat test drilled at Altshofen in Canton Luzerne by Swiss interests has been suspended at a depth of about 5,900 ft. The well is reported to have encountered shows at about 4,200 ft. but these have not been fully tested. Little hope was held for commercial production, but it was said the geological information gained would be valuable in further exploration. The test was financed by Basle interests, and the rig was supplied by International Tiefbohr, A.G., of Celle, Germany.

Plans for the construction of a new refinery east of Southampton Water in southern England by the Trinidad Leaseholds-Caltex Group have been indefinitely deferred, according to a report from Southampton. The site considered was between Titchfield and Warsash. It was said the refinery should now be regarded as a long-term conception.

French refineries processed 1,756,-000 tons of crude oil, an average of about 425,000 bbl. daily, in November last year. Products delivered for consumption included about 107,000 bbl. daily of motor fuel, and about 150,000 bbl. of heavy fuel oil. France, with the second largest refining industry in Europe, now has a total capacity in excess of 450,000 bbl. daily.

The largest tanker constructed since the war in West Germany, the Else Essberger is now on her maiden voyage from the Deutsche Werft, Hamburg. The tanker, 16,800-ton capacity, was launched early in November for John T. Essberger Co.

New Officers of the New York Nomads

In charge of activities during 1953 for the New York chapter of Nomads will be, left to right, A. A. Dill, Axelson Manufacturing Co., regent; G. I. Lynch, Lee C. Moore Corp., assistant secretary; Edmund Burke, Jr., General Motors Overseas Corp., sergeant-at-arms; C. J. DeLay, Continental Supply Co., Inc., vice president; R. V. McIntire, Baker Oil Tools, Inc., president; O. B. Latrobe, Hughes Tool Co., secretary; N. L. Boulden, Jr., International General Electric Co., Inc., treasurer; and L. F. Griffith, Petroleum Machinery Corp., assistant treasurer. Not shown are H. W. Haltom, Beckley, Haltom & Hickman, assistant sergeant-at-arms, and H. B. Book, Reed Roller Bit Co., regent.

PERSONALS

Association Head

L. L. Aubert is president of West Coast oil firm

THE new president of the Western Oil and Gas Association, Lloyd Lees Aubert, 54, has been active in the West Coast petroleum industry for about 3 decades.

Aubert has been president of Bankline Oil Co., Los Angeles, since 1941. He was president of the Norwalk Co. from 1941 until August 1, 1952, at which time Norwalk was merged with Bankline. He also is a director of North American Oil Consolidated and Holly Development Co.

A native of San Francisco, Aubert received a degree in geology from Stanford University in 1922. He later joined General Petroleum Corp., where he became a superintendent. From 1927 to 1941 he served as general manager of Norwalk and Bankline Oil Co.

During World War I Aubert spent 2 years with the U. S. Army Ambulance Corps, and was with American expeditionary forces in France for 18 months.

He is on the board of directors of the American Petroleum Institute, Independent Petroleum Association of America, Oil Producers Agency, and San Joaquin Valley Oil Producers Association. He also is a director of Los Angeles chapter of the American Red Cross, the American Library of Information and Better American Foundation, California Petroleum Safety Board, Inc., and the Welfare Federation of the Los Angeles area.

John L. Townley III has been transferred from the Calgary, Alta., office of Socony-Vacuum Exploration Co. to Swift Current, Sask., as district geologist for western Saskatchewan.

E. A. Eastberg has been promoted to superintendent of production in the Paloma, Calif., unit by Western Gulf Oil Co. With Western Gulf since 1937, Eastberg has been production and drilling foreman for the past 8 years at Paloma. **J. H. Jerome** has been advanced from plant foreman to superintendent of the Paloma cycling plant, with **G. T. Naney**, formerly assistant plant foreman, becoming plant foreman. **William Fendrick**, production foreman, has taken on the added duties of field maintenance work in addition to his former field production duties.

Lewis H. Bond, Jr., who joined the oil loan division of Fort Worth National Bank as a petroleum engineer last June, has been elected assistant vice president. Bond, a graduate of the University of Oklahoma, formerly was a petroleum engineer for Stanolind Oil & Gas Co. He received his discharge from the Army as a captain in 1946.

L. H. Moore has been transferred from Shreveport to Houston as adviser for producing operations for Gulf Oil Corp. in the Gulf Coast district.

Albert Wright, Jr., coordinator of Indonesian affairs for Standard-Vacuum Oil Co. since July 1951, has been elected to the board of directors of International Petroleum Co., Ltd. He formerly was assistant general manager of Standard-Vacuum's producing and refining subsidiary in Indonesia and had worked in British Guiana, Cuba, and Venezuela.

A. A. MacDonald, McKittrick, Calif., independent producer, and **M. O. Johnston**, retired, recently were elected senior members on the Petroleum Production Pioneers board of directors. Junior members elected to the board were: **H. C. Pyle**, Monterey Oil Co.; **B. H. Anderson**, Continental Oil Co.; **D. S. Grubbs**, Oil Well Supply Co.; **Paul Andrews**, Signal Oil & Gas Co.; **J. D. Hughes**, Lane-Wells Co., and **R. R. Von Hagen**, Lloyd Corp., Ltd.

John P. McNaughton will retire February 1 from the Petroleum Administration for Defense to join Neville G. Penrose, Inc., Fort Worth, as assistant to the vice presidents. Before going to Washington, McNaughton was with Gulf Oil Corp. for several years at Hobbs, N. M. He holds degrees in geology from the University of Oklahoma and petroleum engineering from Colorado School of Mines.

Howard S. Rose, president of United Natural Gas Co., Oil City, has been elected president of the Pennsylvania Natural Gas Men's Association. Other officers are: **R. L. Ehrman**, vice president of T. W. Phillips Gas & Oil Co., Butler, vice president; **P. L. Kesel**, Pittsburgh, Carnegie Natural Gas Co., Pittsburgh, secretary-treasurer; and **George Doying**, Mount Lebanon, executive secretary. **Fenton H. Finn**, Pittsburgh, president of New York State Natural Gas Co., has been elected a director.

R. George Murray, Jr., Shreveport, has been elected vice president in charge of operations for Algonquin Gas Transmission Co., Boston. For the past 2 years he has been senior engineer and technical adviser to the general superintendent in the gasoline department of United Gas Pipe Line Co., Shreveport. Previously he was operating superintendent of the company's natural-gasoline plant at Carthage, Tex.

H. M. McDonald has been appointed general superintendent for Texas Eastern Transmission Corp., Shreveport. He has served as acting general superintendent since last April. Also promoted were: **Paul L. Hughen**, assistant manager of the corporation's Division 1, named pipe-line superintendent; **Carl R. Sisson**, assistant manager of Division 3 in West Chester, Pa., appointed manager; and **Murrell Carlisle**, who replaces Sisson as assistant manager of that division.

PERSONALS

West Texas Geological Officers

Here are the newly elected officers of the West Texas Geological Society for 1953. Seated, left to right, are C. Hayden Atchison, British American Oil Producing Co., vice president; W. H. Conkling, State Exploration Co. of Texas, president; and L. E. Patterson, Cities Service Oil Co., immediate past president. Standing at left are Albert H. Hedden, Humble Oil & Refining Co., secretary, and Louis H. Michaelson, Texas Gulf Producing Co., treasurer.

Dr. J. T. Horeczy has been promoted to section head of the research and development division of Humble Oil & Refining Co.'s Baytown, Tex., refinery. He has been engaged in research on catalysts for Humble for 12 years. In his new assignment he will supervise research on analytical methods, radiochemistry, and tracer techniques.

T. Glenn Caley, vice president of Basin Oil Co., president of Goll, Graves & Mechling, Inc., Saginaw, Mich., and president of the Oil and Gas Association of Michigan, has been appointed to the State (Oil) Advisory Board. He will finish out the unexpired term of **Don Rayburn,** Standish independent producer, who resigned recently to devote his efforts to private business. Galey's appointment runs until May 1954.

Tom Newell, Cardinal Chemical Co., Odessa, Tex., and **L. F. Sudduth,** Stanolind Oil & Gas Co., Midland, Tex., have been nominated as chairman of the Permian basin section of the National Association of Corrosion Engineers. Election will take place at Odessa February 9. Other nominees are: **Jack Stafford,** National Tank Co., Odessa, and **E. O. Kemper,** Permian Enterprises, Odessa, first vice chairman; **R. L. Warden,** Shell Oil Co., Odessa, and **W. A. Hopwood,** Odessa, second vice chairman. **Jack Williams,** National Tank Co., Odessa, and **John Knox,** Western Co., Midland, secretary-treasurer; and **C. O. Bundrant,** Western Co., Midland, for trustee.

D. P. Schafer, geophysical consultant, has established offices in Calgary, Alta. He formerly was regional geophysicist for Sinclair Canada Oil Co. in Calgary.

C. I. Wright has been promoted to chief engineer of Shell Chemical Corp.'s Dominguez, Calif., plant. He was formerly senior engineer in the company's New York office.

Hugh F. Wheaton, Sarnia, Ont., has succeeded **William J. Beynon** as assistant refinery superintendent at Regina, Sask., for Imperial Oil, Ltd.

Charles B. Duke has been appointed manager of the refinery supply and distribution division in the manufacturing department of Sun Oil Co. at Philadelphia. He has served as special assistant in the division since 1947. **Edwin H. Sampson, Jr.,** has been appointed assistant manager of the division and **Wirt R. Robinson** assistant manager in charge of distribution.

Charles W. Tucker has been promoted from area petroleum engineer to senior petroleum engineer for Republic Natural Gas Co., Dallas. **Donald D. Wildes,** junior engineer at Dallas, has been promoted to field engineer in the Corpus Christi district.

A. Schuyler Clark, New York, has been appointed a member of the board of directors of New World Oil, Ltd., of Edmonton, Alta., and Denver.

J. L. Adkins, senior engineer for Pan American Producing Co., has been transferred from Grand Chenier, La., to Houston.

John F. Partridge, Jr., formerly district exploration superintendent at Casper, Wyo., for The California Co., has opened offices as an oil exploration consultant there.

J. P. Roetzel, of Old Ocean Oil Co. and J. S. Abercrombie Co., has been elected vice president and controller of Colorado Interstate Gas Co. with headquarters at Colorado Springs, Colo. He is now director, member of the executive committee, vice president, and treasurer of J. S. Abercrombie Co.

E. A. KOENIG

E. A. Koenig has been appointed vice president in charge of operations for Wilcox Trend Gathering System, Inc., Dallas. He formerly was general superintendent for Texas Eastern Transmission Corp., but has been on leave of absence since April to serve as chief of the gas-transmission branch of the gas-operations division of the Petroleum Administration for Defense. **J. C. Riddle,** former division chief dispatcher for Texas Eastern Division 4, and **S. L. Windham,** former measurement engineer in that division, have joined Wilcox Trend.

E. V. Watts, superintendent of General Petroleum Corp.'s southern production division since 1949, has been named assistant to **R. O. Swayze,** recently elected vice president and director of production. **B. H. Robinson,** manager of joint-venture operations since 1947, has been appointed manager of field operations. **D. G. Kingman** takes over the duties of manager of

PERSONALS

joint venture operations, after being assistant manager for the past 6 months. **A. W. Titus,** formerly production superintendent of the southern division, succeeds Watt as superintendent. **H. H. Carrick** has been promoted from assistant to the superintendent to production superintendent of the southern division.

Loring B. Snedden has been elected president of Intex Oil Co. to succeed **L. W. Saunders,** who has been named chairman of the board. Snedden formerly was assistant manager of the producing department of The Texas Co. Other officers named were **Leonard Seaman,** executive president; **W. H. Laird,** vice president; **Walter L. Rowse,** secretary; **Russell R. Goff,** assistant secretary; and **Frank Rosenlieb,** assistant treasurer.

J. J. O'Donnell, manager of personnel and labor relations for Lummus Co., New York, was reelected president of the National Constructors Association at the recent annual meeting in New York. The new vice president is **T. C. Williams,** of Stone & Webster Engineering Corp.'s Badger Process Division, Boston. He succeeds **C. D. Haxby,** of Rust Engineering Co., Pittsburgh. **H. C. Christman,** Fluor Corp., Ltd., Los Angeles, was named chairman of the foreign committee.

Robert L. Bullock, head of the corrosion unit of the engineering department of Interstate Oil Pipe Line Co., Shreveport, has been elected director of the National Association of Corrosion Engineers. He will serve a 3-year term representing active members of the N.A.C.E. in the Arkansas-Louisiana-Texas area.

Dick Flattley, Richardson Gasoline Co., Kermit, Tex., has been elected president of the Permian basin section of the Instrument Society of America. Other new officers are: **Paul Stewart,** Stanolind Oil & Gas Co., Midland, program vice president; **Gene Estes,** Shell Oil Co., Notree, Tex., vice president; **Jay Robison,** Odex Engineering & Equipment Co., Odessa, employment vice president; **Joe Willings,** Shell Oil Co., Midland, membership vice president; **Jack Ray,** Daniel Orifice Fitting Co., Odessa, secretary; **Lynn Witherspoon,** Vinson Supply Co., Odessa, treasurer; and **B. J. Williams,** Foxboro Co., Odessa, publicity chairman.

William J. Owen, formerly a geologist for Atlantic Refining Co. at Big Lake, Tex., has joined Hunt Oil Co. at Grand Junction, Colo.

Sidney M. Blair, Toronto, Ont., and **Donald L. Roberts,** Vancouver, B. C., have been elected directors of Canadian Bechtel, Ltd.

William T. Eastes, party chief for Atlantic Refining Co., has been transferred from Anadarko to Clinton, Okla.

Frank Zimmerman has been named division production superintendent for Kansas and Oklahoma by W. C. McBride, Inc.

J. Howard Barnett has resigned, effective February 15, as Rocky Mountain division engineer for Stanolind Oil & Gas Co. to enter private practice in Casper, Wyo., as a petroleum consultant in oil field appraisal, evaluation, and engineering field work.

W. J. Williams, tool pusher for Brinkerhoff Drilling Co. in West Texas, has been promoted to drilling superintendent at Casper, Wyo.

S. V. McCollum has been promoted to assistant production manager for Continental Oil Co.'s southwestern region at Fort Worth. He replaces **R. G. Parker,** who recently was promoted to production manager for the central region at Oklahoma City. McCollum has been purchasing agent at Ponca City, Okla., the past 3 years.

Henry P. Wickham has been selected to manage the expanded operating division of M. W. Kellogg Co., international refinery and chemical plant engineer-contractors of New York City. He has been associated with Kellogg's fluid catalytic processing developments.

James P. Patton, field superintendent for Fisher-McCall Oil & Gas, Inc., since 1938, has resigned. He has joined **Harold J. Shuck,** cable-tool drilling contractor, in organizing Grand Valley Drilling Co., at Grandville, Mich.

Joseph Vercillino has been transferred from the geological department of Carter Oil Co. at Billings, Mont., to Miles City, Mont. He has been replaced at Billings by **George B. Hickok,** who formerly was located in the Wichita office.

O. V. McIntyre has been named president of Hemisphere Western Oil Co., a new firm organized at Oklahoma City. Other officers are: **John H. Taylor,** vice president, and **Carter C. Hardwick,** secretary treasurer.

DEATHS

James Monroe Campbell, 52, owner of Campbell Drilling Co., died January 13 at Houston.

Demmer D. Swabb, 76, retired engineer for Magnolia Petroleum Co., died in Tulsa, January 17, of a heart attack. He worked for Magnolia 23 years in Cushing, Drumright, Davenport, and Oilton, Okla., and retired in Tulsa in 1943.

John B. Foster, 70, former operator who was connected with Gilliland Oil Co. in the development of Smackover field in Arkansas, died in Oklahoma City, January 17. He was active in Creek County, Oklahoma, where he first found oil in 1910, and in El Dorado field in Kansas.

Stanley C. Van Dyke, 50, who formerly owned Van Dyke Oil Co., Pasadena, Calif., was drowned January 16 near Waikiki Beach, Honolulu.

Baisley Powell Elebash, 55, managing trustee for Petroleum Land & Royalty Syndicate, died January 16 at St. Thomas, Virgin Islands, following a heart attack. He retired in 1937 as a partner in the firm of Billings, Olcott & Co. and since that time had been engaged in the development of oil royalties. He was a director of Haitian Corp.

Wilbur Dain Pound, 61, formerly a driller and tool pusher for Comail Oil Co., died in a Norman, Okla., hospital January 11.

THE OIL AND GAS JOURNAL'S

annual

REVIEW AND FORECAST SECTION

. . . How the industry shapes up as another promising year gets under way

The Picture at a Glance . . . . . .

DRILLING SCHEDULED for 1953 calls for a total of 190,285,000 ft. of hole and 46,230 wells including 11,115 wildcats and 35,115 field wells.

TOTAL COMPLETIONS in 1952 amounted to 45,840 wells and 187,252,000 ft. to set another record. The total included 23,466 oil wells and 3,255 gas wells.

MORE WILDCATS were completed in 1952 than in any previous year, but success ratio was lowest in 5 years.

CRUDE PRODUCTION averaged 6,265,000 bbl. daily in 1952 and is forecast at 6,353,300 bbl. daily in 1953. New production records were set in 12 states in 1952.

PROVED RESERVES of total liquid hydrocarbons increased 1,939,000,000 bbl. in 1952 to a total of 33,735,000,000 bbl. Crude gained 1,507,000,000 bbl. and natural-gas liquids increased 432,000,000 bbl.

NATURAL-GAS PRODUCTION reached a new high of 8.02 trillion cubic feet for a gain of 7.5 per cent over 1951. Gas reserves at end of year were estimated at 196,980 billion cubic feet.

DOMESTIC DEMAND for 1953 is forecast at 7,647,900 bbl. daily, up 5 per cent from 1952. Demand in 1952 gained 3.6 per cent over 1951.

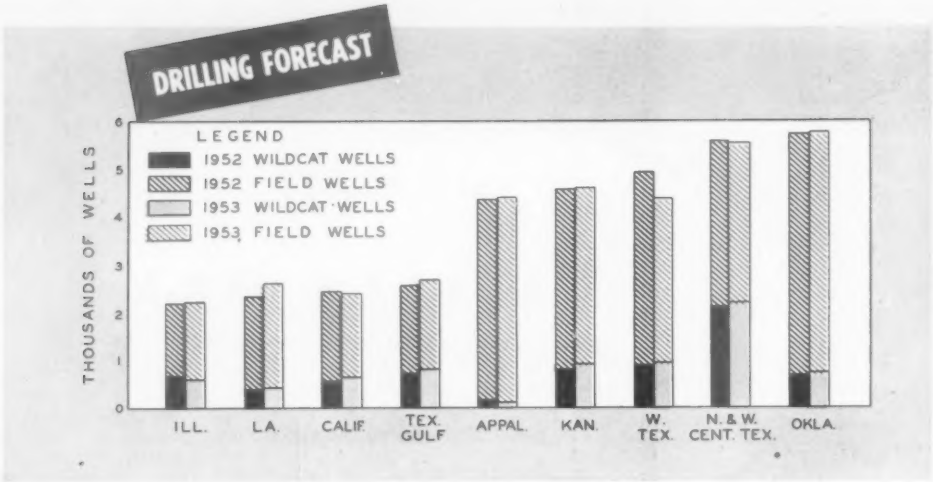
FREE-WORLD PRODUCTION in 1952 averaged 11,220,300 bbl. daily for an increase of 4.1 per cent compared with gains of 13 per cent in 1951 and 12 per cent in 1950.

REFINERY RUNS for 1952 were at an all-time high despite the strike. The year's average was 6,670,000 bbl. daily, and the 1953 rate is forecast at 6,863,000 bbl. daily.

PRODUCTION at natural-gasoline and cycling plants set a new record in 1952 with 604,700 bbl. daily. The forecast of 636,000 bbl. daily for 1953 represents another record.

REFINERY EXPANSION programs include 11 new refinery projects in the United States and Canada and 10 authorized major projects covering additions to existing refineries in the United States.

PIPE-LINE CONSTRUCTION plans call for 30,300 miles of petroleum and natural-gas lines in the United States and abroad.



NEW RECORD FORECAST

46,230 Wells Scheduled for This Year

by John C. Casper

THE oil industry will drill 46,230 wells in this country this year. This will set a new all-time record for the number of wells drilled in a year, but will represent the smallest increase since 1949.

Wildcat completions for the year will increase 544 wells to a total of 11,115. Development completions are projected at 35,115 for a decrease of 154 wells over 1952. The gain in total completions is expected to be about 390 wells compared with increases of 4,241 wells in 1950, 1,237 in 1951, and 1,324 in 1952.

The forecast is based on operators' replies to The Oil and Gas Journal's survey. Completed questionnaires were received from hundreds of operating companies from every active area in the country. Some replies carried comments explaining increases or decreases in areas where the shifts in drilling are to be more pronounced.

Operators were asked to give actual projected drilling for the year, not the number of wells they would like to drill nor the maximum that could be drilled if an important strike increased drilling prospects during the year.

Actual tabulation of all replies showed that the reporting companies planned to drill 52 fewer wells in 1953 than they completed in 1952. However, since total replies did not cover all drilling for last year, the varying ratios of reported drilling to total drilling by states and areas shifted the expanded total for 1953 from a decrease to a small increase.

Operators' comments for the most part covered abnormal changes for particular areas but did not furnish definite clues that would lead to a clear explanation of the small increase in drilling projected for 1953.

There are several possible causes for decreases or smaller-than-normal increases in drilling. These include: Material shortages; lack of manpower; a decrease in the number of prospective drilling area; abnormally high drilling rates in recent years; a pronounced increase in amount of crude found on an average for each well drilled; high ratio of reserves to production; or soft crude markets.

Many of these causes are related and represent links in the chain that can end in lower drilling. However, most of these possible causes are not present in the situation today.

Drilling Rates Not Abnormally High

Drilling rates for the past few years cannot be said to be abnormally high. The accompanying small table shows a comparison of drilling and production since 1940. The comparisons are made possible by expressing the annual figures as indexes, based on the average for 1935-39 equal to 100. It will be noted that crude production in 1952 was 195 or 1.95 times the average production for the base years. On the other hand, the number of wells drilled last year was only 1.69 times the average for the 1935-39 period. Also, the lack of drilling in the war years, shown by the low index numbers, had to be made up after material again became available.

The ratio of total liquid reserves to total liquid production in 1952 was less than in either 1949 or 1950. For 1950 the ratio was 13.70 and in 1949, a year with small demand increases, the ratio was 14.20. Reserves at the end of 1952 divided by production of crude and natural-gas-liquid production in 1952 amounted to 13.42.

Most operators and all geologists agree that many areas remain to be tested with the drill. They are not running out of places to drill.

More pipe will be available for drilling wells in 1953 than in 1952. The steel strike in the summer and the loss during the period of labor trouble in the

Drilling Forecast for 1953 by Areas

	1953 forecast				Change from 1952 actual			
	Wildcat wells	Field wells	Total wells	Total footage	Wildcat wells	Field wells	Total wells	Total footage
Alabama	48	30	78	434,000	8	—2	6	22,000
Arkansas	115	307	422	1,611,000	18	—23	—5	22,000
California	670	1,786	2,456	10,527,000	73	—50	23	214,000
Colorado	251	230	481	2,554,000	6	—11	—5	—26,000
Florida	14		14	84,000	4		4	22,000
Illinois	622	1,540	2,162	5,364,000	—34	47	13	52,000
Indiana	430	803	1,233	2,189,000	6	—50	—44	—66,000
Kansas	905	3,710	4,615	15,769,000	60	—16	44	249,000
Kentucky	337	982	1,319	2,605,000	31	—12	19	37,000
Louisiana	429	2,170	2,599	18,026,000	28	186	214	2,365,000
Northern	177	1,090	1,267	4,623,000	—18	—19	—37	—192,000
Southern	252	1,080	1,332	13,403,000	46	205	251	2,557,000
Michigan	323	402	725	1,828,000	46	—28	18	20,000
Mississippi	156	172	328	2,291,000	—26	6	—20	—149,000
Montana	118	325	443	1,653,000	20	78	98	396,000
Nebraska	191	113	304	1,400,000	4	—10	—6	—41,000
New Mexico	184	929	1,113	6,157,000	19	41	60	324,000
New York	5	728	733	1,005,000	1	—35	—34	—45,000
North Dakota	63	171	234	1,929,000	27	85	112	927,000
Ohio	43	1,060	1,103	2,393,000	2	49	51	98,000
Oklahoma	736	5,061	5,797	21,678,000	6	10	16	57,000
Pennsylvania	14	1,932	1,946	3,802,000	—6	68	62	89,000
South Dakota	22		22	78,000	8		8	30,000
Texas	5,151	11,428	16,579	80,637,000	300	—566	—266	—1,814,000
Dists. 1 and 4	919	1,608	2,527	11,496,000	79	88	167	668,000
Dists. 2 and 3	811	1,850	2,661	17,586,000	85	—6	79	618,000
Dists. 5 and 6	276	498	774	4,369,000	24	—35	—11	—86,000
Dists. 7-B and 9	2,148	3,380	5,528	18,727,000	65	—77	—12	39,000
Dists. 7-C and 8	903	3,471	4,374	26,027,000	33	—604	—571	—3,362,000
Dist. 10	94	621	715	2,432,000	14	68	82	309,000
Utah	42	40	82	527,000	—8	11	3	22,000
West Virginia	10	548	558	1,579,000	—4	—44	—48	—170,000
Wyoming	164	604	768	3,895,000	—9	77	68	366,000
Miscellaneous	72	44	116	270,000	—36	35	—1	32,000
Total United States	11,115	35,115	46,230	190,285,000	544	—154	390	3,033,000

spring resulted in no allocation for the fourth quarter of 1952. Some of the output for this year will go to refill the normal supply lines from the mill to the well, but even after these inventories are replaced the supply of pipe for drilling will show a much larger percentage increase over 1952 than the planned increase in drilling as reported by the operators themselves.

Manpower a Factor

It is possible that the shortage of manpower will be an important factor in limiting drilling this year. This is not just a shortage of men to do the actual drilling, but a shortage of personnel in the supporting divisions of the company—geologists, engineers, land men, and others who handle the mass of information needed to plan a drilling program.

Since drilling is related to the need for crude production which in turn depends on demand for products, the certain gains in demand in the future will call for more wells per year than have been drilled in the past.

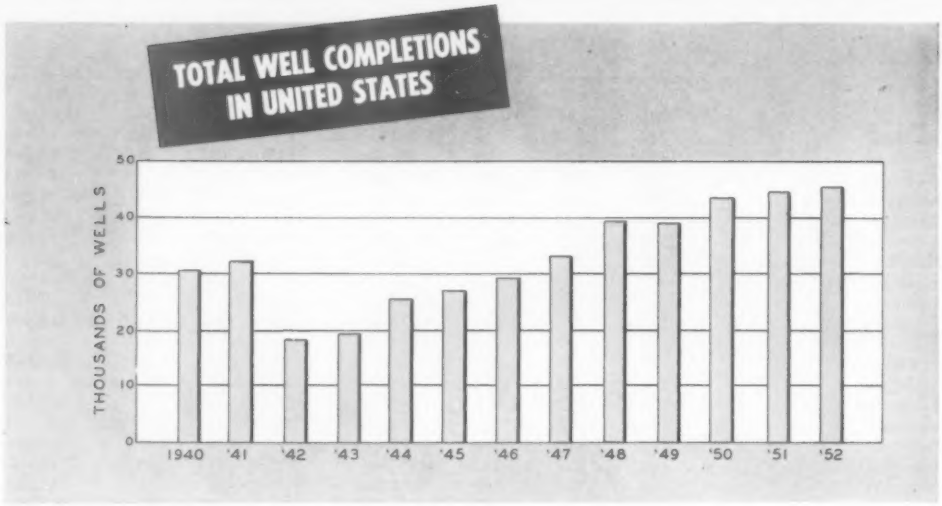
The details of drilling forecast for 1953 are shown in the large table. Deeper average depth is indicated by a larger percentage increase in footage than in number of wells.

The greatest change for the year is in development drilling in West Texas, representing a reduction in Spraberry wells. Many of the rigs at the peak of Spraberry drilling were reported to have been pulled from District 4 in Texas. The scheduled increase in drilling for this district in 1953 indicates that some of the rigs are being moved back.

DRILLING VS. CRUDE PRODUCTION

(Production in thousands of barrels daily)

			Indexes 1935-39 = 100	
	Wells	Production	Wells	Production
1940	30,040	3,697	111	115
1941	32,140	3,842	119	120
1942	18,150	3,799	67	118
1943	19,477	4,125	72	129
1944	25,262	4,584	93	143
1945	26,879	4,695	99	146
1946	29,229	4,751	108	148
1947	33,122	5,088	122	159
1948	39,778	5,520	147	172
1949	39,038	5,046	144	157
1950	43,279	5,407	160	169
1951	44,516	6,149	164	192
1952	45,840	6,265	169	195
1953	46,230	6,353	170	198



NEW RECORD IN WELLS FINALED

Operators Completed 45,840 Wells in 1952

by John C. McCaslin

THE steel strike last summer and the resulting shortages of tubular goods failed to keep the industry from setting a new all-time high in the number of wells completed in 1952.

Operators finished 45,840 wells in 1952, up 3 per cent over the previous year. The footage drilled to set this new record amounted to over 187 million feet, or up 8.65 per cent over the previous year.

Oil wells accounted for about 51 per cent of total completions in the United States, while gas wells accounted for 7 per cent of total completions.

The new drilling records set during 1952 were forecast in July after replies to The Oil and Gas Journal's midyear drilling survey were tabulated.

The midyear forecast showed that operators were planning to complete 45,791 wells during 1952. They completed 49 more than that. This forecast also showed that an estimated 188 million feet of holes would be dug if drilling plans were not altered because of the steel shortage. The industry fell slightly short of that goal. The higher percentage of wells drilled in the deeper depth classifications during 1952, a factor not so apparent during 1951, brought about the record footage-drilled total.

Success Ratios

Of the 45,840 wells completed in 1952, 23,466 were finaled as producing oil wells and 3,255 as gas wells. Thus, exclusive of service wells (wells not expressly drilled for oil or gas, such as those drilled for disposal, input, or storage), 17,637 dry holes were completed during the year, 984 more than in 1951, a 5 per cent increase. A total of 1,482 service wells was completed during the year, mostly in New York and Pennsylvania.

The largest oil-producing state in the union accounted for over 36 per cent of the total completions in the United States. Texas had 41 per cent of all the oil wells and 23 per cent of all the gas wells that were finished, and 44 per cent of all footage drilled was recorded in the big state. Drilling activity in Texas makes all other states small by comparison.

Total completions in the leading areas of activity in the nation would run as follows by dividing Texas into its Railroad Commission districts: Oklahoma, 5,781; West Texas (7-C and 8), 4,945; Kansas, 4,571; North Central Texas (9), 3,205; California, 2,433; Louisiana, 2,385; West Central Texas (7-B), 2,335; Illinois, 2,149; Pennsylvania, 1,894; Texas Gulf Coast (3), 1,759; and Southwest Texas (4), 1,602.

Big Year in Rockies

The Rocky Mountain states of Colorado, Utah, Montana, New Mexico, and the newest oil-producing state, North Dakota, all showed great success in drilling activity in 1952, while Wyoming showed the only decline, slight that it was, in wells completed.

Completions in Colorado almost doubled 1951's figures, while North Dakota, reporting only 12 completions in 1951, recorded 122 completions in 1952, 66 per cent of them oil wells.

A large-scale program of development drilling in the Denver-Julesburg basin areas of Colorado and western Nebraska accounted for the increase in completions in those two areas. Nebraska completions were up 28 per cent over 1951. Most of the area's 46 new discoveries were in the Denver-Julesburg basin. The comparative shallow depths and the resulting cheaper drilling costs gave impetus to increased development activity in and around the new discoveries.

Total Footage Drilled in United States By Years

(Thousands of feet)

	1944	1945	1946	1947	1948	1949	1950	1951	1952
Arkansas	1,190	828	728	1,409	1,270	1,283	1,342	1,522	1,589
California	7,527	8,671	7,509	8,764	10,579	10,443	7,966	9,566	10,313
Colorado	207	352	1,063	1,151	1,228	359	409	1,425	2,580
Illinois	4,958	4,565	5,925	5,251	6,386	6,362	6,311	6,044	5,312
Indiana	581	500	1,071	1,206	2,023	2,357	2,642	2,455	2,255
Kansas	6,194	5,877	6,556	8,690	10,634	10,715	12,744	15,035	15,520
Kentucky	1,863	1,275	1,175	1,194	1,515	1,853	2,076	2,412	2,568
Louisiana	5,723	7,774	8,464	8,709	10,934	12,477	14,554	14,189	15,662
Northern	1,408	2,117	3,175	2,912	4,128	4,453	4,626	4,741	4,815
Southern	4,315	5,657	5,289	5,797	6,806	8,024	9,928	9,448	10,847
Michigan	1,620	1,963	1,749	1,935	1,983	2,209	2,118	1,860	1,808
Mississippi	776	2,403	1,971	4,131	3,312	2,388	2,258	2,539	2,441
Montana	946	754	661	630	819	650	621	640	1,257
New Mexico	1,322	1,508	1,624	2,512	2,602	2,419	2,747	3,777	5,833
N. Y., Pa., and W. Va.	10,038	10,225	9,985	9,702	9,293	5,835	5,381	5,800	6,512
North Dakota	0					24	27	65	1,002
Ohio	2,730	2,689	3,402	3,913	3,498	2,286	2,172	2,057	2,295
Oklahoma	7,172	10,048	9,771	12,151	15,515	15,339	19,865	20,542	21,621
Texas	26,621	32,495	34,352	41,029	52,746	57,462	71,975	76,777	82,451
N. Central (7-B & 9)	4,395	5,864	7,065	8,544	11,312	12,831	14,513	16,017	18,688
West (7-C & 8)	7,572	8,497	8,815	10,809	15,428	16,398	26,543	28,233	29,389
Panhandle (10)	984	1,686	943	1,593	2,053	3,015	2,804	2,307	2,123
Eastern (5 & 6)	1,867	2,504	3,792	3,070	3,383	4,992	4,928	5,603	4,455
Gulf Coast (2 & 3)	9,491	11,690	11,599	9,559	11,995	11,880	13,706	14,328	16,968
Southwest (1 & 4)	2,312	2,254	2,138	7,454	8,575	8,346	9,481	10,289	10,828
South Dakota	0		16	8	4	11	30	3	48
Wyoming	907	967	716	1,203	2,501	2,803	2,994	3,789	3,529
Miscellaneous	371	346	318	473	550	728	1,056	1,834	2,656
Total U. S.	80,746	93,240	97,056	114,061	137,392	138,003	159,288	172,331	187,252

Total Completions in United States By Years

	1944	1945	1946	1947	1948	1949	1950	1951	1952
Alabama	34	37	16	29	21	19	43	50	72
Arkansas	215	185	183	329	301	322	407	429	427
California	2,034	2,150	1,790	2,053	2,876	2,512	1,829	2,361	2,433
Colorado	33	60	167	209	207	82	99	289	486
Florida	13	20	28	35	26	24	13	2	10
Illinois	1,949	1,749	2,343	2,033	2,438	2,711	2,823	2,424	2,149
Indiana	303	305	582	681	1,082	1,279	1,534	1,369	1,277
Kansas	1,837	1,796	2,027	2,694	3,284	3,387	4,010	4,501	4,571
Kentucky	933	737	714	660	908	1,047	1,150	1,309	1,300
Louisiana	803	1,108	1,384	1,626	2,325	2,371	2,453	2,240	2,385
Maryland		0	0	1	0	0	0	45	35
Michigan	655	770	788	909	895	995	897	746	707
Mississippi	156	362	260	491	428	334	313	375	348
Missouri†	0	0	0	0	0	0	27	18	18
Montana	387	312	313	309	345	279	270	262	345
Nebraska	33	32	18	7	62	49	171	241	310
New Mexico	414	424	411	562	606	501	607	773	1,053
New York		1,423	1,544	1,531	1,344	882	657	627	767
North Dakota	0	0	0	0	0	0	1	‡13	122
Ohio	1,023	1,014	1,275	1,377	1,393	1,084	1,027	971	1,052
Oklahoma	1,890	2,521	3,050	3,846	4,293	4,352	5,459	5,626	5,781
Pennsylvania	6,543	3,642	3,584	3,238	3,159	1,920	1,581	1,738	1,884
South Dakota	0	0	9	3	0	0	14	0	14
Texas	5,729	7,195	7,804	9,301	12,251	13,665	16,585	16,655	16,845
Utah	4	0	4	4	18	49	17	39	79
West Virginia		806	755	882	846	518	652	622	606
Wyoming	205	227	168	267	584	587	615	745	700
Miscellaneous	69	4	11	45	86	69	25	46	64
Total	25,262	26,879	29,228	33,122	39,778	39,038	43,279	44,516	45,840

Total United States Completions By States

	Total comp.	Oil	Gas	Service	Dry	Average footage	Comp. 1951
Alabama	72	30	1	0	41	5,722	50
Arkansas	427	217	7	1	202	3,721	429
California	2,433	1,790	43	10	590	4,239	2,361
Colorado	486	162	29	0	295	5,309	289
Florida	10	0	0	0	10	6,256	2
Illinois	2,149	825	18	7	1,299	2,472	2,424
Indiana	1,277	408	18	8	843	1,766	1,369
Kansas	4,571	2,194	316	46	2,015	3,395	4,501
Kentucky	1,300	406	227	6	661	1,976	1,309
Louisiana	2,385	1,386	206	7	886	6,567	2,240
North	1,304	683	139	6	476	3,692	1,249
South	1,081	603	67	1	410	10,034	991
Maryland	35	0	22	0	13	4,027	45
Michigan	707	253	30	68	356	2,557	746
Mississippi	348	111	4	0	233	7,013	375
Missouri	18	0	6	0	12	983	18
Montana	345	163	18	0	164	3,643	262
Nebraska	310	100	10	0	200	4,648	241
New Mexico	1,053	525	319	0	209	5,539	773
New York	767	388	0	375	4	1,369	627
North Dakota	122	80	0	0	42	8,213	12
Ohio	1,052	406	219	80	347	2,181	971
Oklahoma	5,781	3,086	295	153	2,247	3,740	5,626
Pennsylvania	1,884	858	220	688	118	1,971	1,738
South Dakota	14	0	0	0	14	3,463	1
Texas	16,845	9,682	778	33	6,352	4,301	16,655
North Central (9)	3,205	1,686	24	22	1,473	3,349	2,691
West Central (7-B)	2,335	1,105	31	1	1,198	3,407	2,326
West (7-C & 8)	4,945	3,823	28	1	1,093	5,943	5,113
Panhandle (10)	633	279	230	2	122	3,353	729
Eastern (5 & 6)	785	386	60	3	336	5,675	1,174
Gulf Coast (2)	823	316	110	0	397	6,411	775
Gulf Coast (3)	1,759	970	124	1	664	6,647	1,538
Southwest (1)	758	320	16	2	420	3,027	601
Southwest (4)	1,602	797	155	1	649	5,327	1,708
Utah	79	21	7	0	51	6,395	39
West Virginia	606	69	443	0	94	2,887	622
Wyoming	700	403	16	0	281	5,042	745
Miscellaneous	64	3	3	0	58	3,438	46
Total 1952	45,840	23,466	3,255	1,482	17,637	4,085	
Total 1951	44,516	23,453	3,030	1,380	16,653	3,871	44,516
Total 1950	43,279	24,430	2,843	1,249	14,757	3,680	
Total 1949	39,038	22,042	2,887	1,382	12,727	3,538	
Total 1948	39,778	22,585	2,897	2,270	12,076	3,454	
Total 1947	33,122	17,999	3,305	2,280	9,538	3,443	

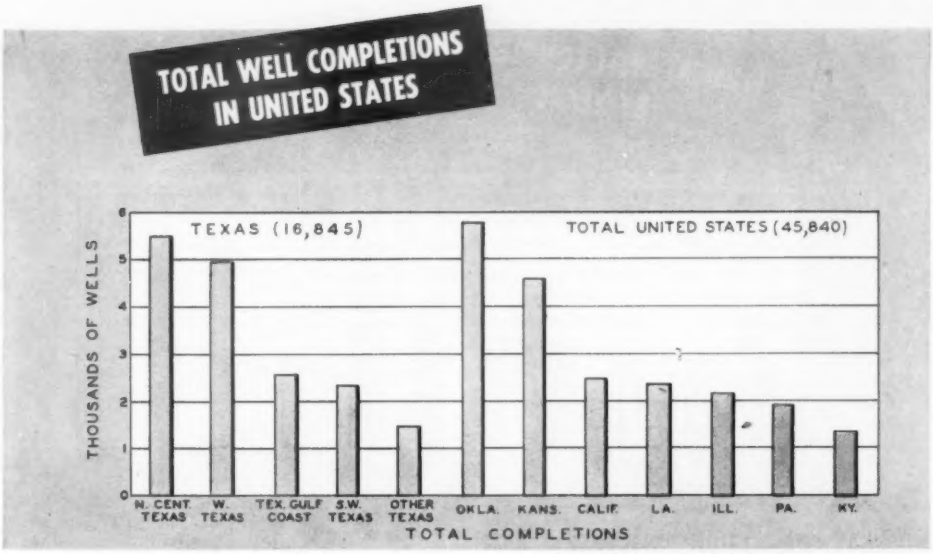
Rapid development of Beaver Lodge and Tioga pools in North Dakota picked up speed early in 1952 and continued at a steady pace throughout the year, putting North Dakota into the production and well completion columns with promises of becoming one of the major oil-producing states in the near future.

Montana completions showed a 31 per cent increase over the previous year. Important new discoveries in the eastern portion of the state in the Williston basin caused a flurry of activity in 1952 with promise of increased development in 1953. Poplar field was the most active new pool from the development standpoint in Montana's Williston basin region. Other important development activity took place in the Richey, Pine Unit, and Glendive areas. Operators completed 151 oil wells and 18 gas wells in the state's oil pools, finaling only 78 dry holes.

Wyoming completions fell slightly from 1951's figures, but operators completed 382 oil wells and 10 gas wells in that state's pools. Wildcatters completed 27 discoveries in the state in 1952 adding to that state's reserves and potentialities.

Increased outlet for crude oil made possible by the completion of the Platte Pipe Line which runs from Wyoming through Nebraska producing areas to Wood River, Ill., had much to do with the increased activity in Colorado and Nebraska as well as the steady activity in Wyoming. The Denver-Julesburg basin area is becoming more and more attractive to the independents due to the comparatively shallow depths and low drilling costs. This fact plus the new outlet is the green light for increased drilling activity.

New Mexico completions were up 36 per cent over the previous year. Operators completed 1,053 wells



during the year, 525 of them oil wells, and 319 of them gas wells. These New Mexico figures are southeastern and San Juan basin figures collectively. Increased demand for gas on the West Coast plus additional transportation facilities brought about a substantial increase in the number of gas wells completed in the San Juan basin area of the state. New discoveries and resulting development increased the southeastern section's completions for the year also.

DEVELOPMENT COMPLETIONS BY STATES

	Comp.	Oil	Gas	Dry
Alabama	32	24	0	8
Arkansas	330	206	7	117
California	1,836	1,718	35	83
Colorado	241	143	19	79
Florida	0	0	0	0
Illinois	1,493	749	14	730
Indiana	853	369	14	470
Kansas	3,726	2,104	299	1,323
Kentucky	994	375	224	395
Louisiana	1,984	1,228	190	566
North	1,109	667	132	310
South	875	561	58	256
Maryland	0	0	0	0
Michigan	430	228	25	177
Mississippi	166	86	3	77
Missouri	8	0	3	5
Montana	247	151	18	78
Nebraska	123	88	5	30
New Mexico	888	477	315	96
New York	763	388	0	375
North Dakota	86	76	0	10
Ohio	1,011	404	211	396
Oklahoma	5,051	2,978	282	1,791
Pennsylvania	1,864	858	217	789
South Dakota	0	0	0	0
Texas	11,994	8,855	652	2,487
North Central (9)	2,157	1,474	13	670
West Central (7-B)	1,300	889	16	395
West (7-C & 8)	4,075	3,656	19	400
Panhandle (10)	553	274	223	56
Eastern (5 & 6)	533	357	56	120
Gulf Coast (2)	487	279	88	120
Gulf Coast (3)	1,369	897	110	362
Southwest (1)	410	299	12	99
Southwest (4)	1,110	730	115	265
Utah	29	18	6	5
West Virginia	592	69	438	85
Wyoming	527	382	10	135
Miscellaneous	1	0	0	1
Total 1952	35,269	21,974	2,987	10,308
Total 1951	34,214	21,922	2,771	9,521

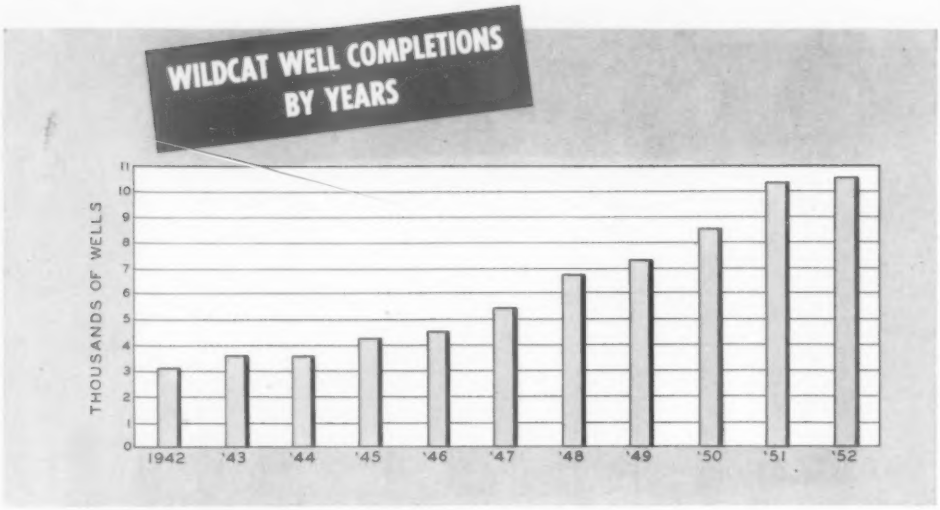
Oklahoma-Kansas Up

While wildcatting activity was down from the previous year's figures, total completions in Oklahoma and Kansas were up slightly. The industry reported that completions in Oklahoma were up about 2 per cent over 1951. Operators finished 5,781 wells in Oklahoma, 4,571 in Kansas. Footage drilled and total completions in the two states have been increasing steadily since 1949. New discoveries in the Anadarko basin in both states have added to the potentialities of that deep area thus increasing the footage to a record 21,621,000 ft. in Oklahoma, 15,520,000 ft. in Kansas. Increased activity in Oklahoma's deep producing areas in Beckham and Washita counties also contributed a large share of the increased footage drilled in 1952.

Tri-States Down

Completions in the Illinois-Indiana-Kentucky area were down considerably from the previous year's totals. Illinois completions showed a 12 per cent decline from 1951 totals, while Indiana and Kentucky reported fewer total completions. Wildcatting activity was down in all three states also.

Michigan completions were down slightly, but Ohio reported a good year with 1,052 wells completed, 406 of them for oil, 219 for gas. New York and Pennsylvania both recorded marked increases in completions. The industry completed 767 wells in New York, a 22 per cent increase over the previous year. Completions in Pennsylvania revealed an 8 per cent increase over 1951. Of the 1,884-well total, 858 were oil wells, 220 gas wells, 688 service wells, and 118 dry holes. Continued development activity in the Bradford areas of New York and Pennsylvania plus successful development of Driftwood pool in the Keystone state resulted in higher completion rates in 1952.



WILDCAT COMPLETIONS INCREASE

Exploratory Drilling Hits Record Levels

by John C. McCaslin

EXPLORATORY drilling during 1952 was expanded to new record levels with the industry reporting 10,571 wildcat completions, up 3 per cent over the previous year's record. The ratio of wildcat drilling to field development operations remained at the previous year's level, however. The number of wildcat wells completed was 23.1 per cent of all wells completed, wildcat and field development, the same as in 1951. During 1950 wildcat wells comprised only 19.9 per cent of all wells completed.

A substantial increase in total footage drilled in exploratory work was noted in 1952. This reached a record-breaking aggregate of 47,688,040 ft., as compared with 1951's record 43,569,443 ft., or up more than 9 per cent.

The large increase in footage drilled was not due entirely to the greater number of wells, however, but also to the fact that the average depth of the wells was slightly greater than that of the wells drilled during the previous year. The average depth of the 1952 wildcat wells was 4,511 ft., 282 ft. deeper than the average of 4,229 ft. in 1951.

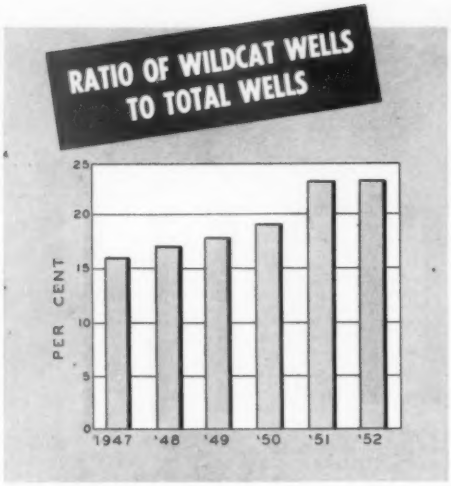
Texas led with the greatest wildcat footage on record for that state. The 1952 total wildcat footage in Texas was 23,444,000 ft., up 2,314,000 ft. over the previous year's record. Oklahoma followed with 3,452,000 ft. of exploratory tests, down slightly from the previous year. Louisiana was in third place with 3,398,000 ft., up 361,000 ft. over the previous year. Kansas dropped from second to fourth place with 3,292,000 ft., down 367,000 ft. from 1951.

Of the total wildcats drilled during the year, 1,488 were completed as oil producers, compared to 1,531 the previous year. There were 268 new gas discoveries, compared to 259 in 1951, and 8,815 dry holes, compared to 8,512 during the previous year. Total successful wells showed a drop of 34 from 1951's figures. These figures include not only those which opened new fields, but also those which opened new productive horizons in or extended productive areas of existing fields.

The success ratio of wildcat wells figured 16.6 per cent, while that of 1951 figured 17.3 per cent, a drop of 0.7 per cent. The success ratio in 1950 was 17.7 per cent. This fractional decline follows a trend that has been apparent for several years. Texas showed the highest success ratio in the number of oil wells,

U. S. EXPLORATION RESULTS IN 1952

State—	Total wildcats	Per cent— Oil	Gas	Dry
Texas	4,851	16.9	2.5	80.6
Kansas	845	10.7	2.0	87.3
Oklahoma	730	14.7	2.0	83.3
Illinois	656	11.5	0.6	87.9
California	597	12.0	0.1	87.9
Indiana	424	9.1	0.9	90.0
Louisiana	401	14.4	3.9	81.7
Kentucky	306	10.0	0.9	89.1
Michigan	277	9.0	1.9	89.1
Colorado	245	7.7	4.1	88.2
Nebraska	187	6.4	2.6	91.0
Mississippi	182	13.7	0.5	85.8
Wyoming	173	12.1	3.5	84.4
All others	697	12.8	7.1	80.1
Total 1952	10,571	14.1	2.5	83.4
Total 1951	10,302	14.8	2.5	82.7
Total 1950	8,554	15.1	2.6	82.3
Total 1949	7,294	14.9	2.7	82.4
Total 1948	6,877	15.0	3.6	81.4



reporting 16.9 per cent of all wildcat completions as successful oil discoveries.

As usual, Texas led the states in wildcat completions. Operators completed 4,851 exploratory tests in that state, an increase of 10 per cent over the previous year's record total. Of the total wildcats drilled in Texas during 1952, 949 of them were classed as new oil discoveries and gas strikes. That total includes newly opened pools, new pays, and extensions in old fields. Over 23 million feet of exploratory hole was recorded in Texas. Kansas reported the second highest number of wildcats completed, a position that state took in 1951. However, of the total 845 only about 12 per cent were successful. Important new producing areas were opened in southwestern Kansas during the year, particularly in areas around and in the Hugoton embayment area. Operators in Kansas drilled 16 per cent fewer wildcats in 1952 than in the previous year. Oklahoma remained in third place. However, the industry finaled 100 fewer wildcats during the year than in 1951, dropping the total for 1952 to 730, of which 121 were successful. Oklahoma reported an important year for wildcatting from the rank new areas standpoint. Major developments of the year centered in the western portion of the state, particularly in Beaver County, where seven new fields were discovered.

The Rocky Mountain region had an outstanding year in exploratory drilling. Colorado showed the biggest gain in wildcat completions. Total wildcat completions in that state were 245, 29 of which were new discoveries, a gain of 71 per cent over the previous year. All states in the Rockies showed substantial gains over 1951's records. Wyoming reported 27 new discoveries, Utah 4, North Dakota 4, Montana 12, and Nebraska 17.

There was a marked increase in the average depth of wildcats drilled in the area, increasing from 4,919 ft. to 5,149 ft. Drilling in the deeper portions of the Williston basin was the primary factor for the increase in the average depth of wildcats drilled. The Denver-Julesburg basin was once again the most active area in the region. However, Colorado's most outstanding discovery of the year was in the Coalmont anticline area in Jackson County, western Colorado. In Wyoming production was extended further northward in the Powder River basin with continued successful deep drilling in the Big Horn basin. Montana continued to have a high-success ratio in its exploratory program, particularly in the Williston basin areas of the state. About 12 per cent of all wildcats drilled in Montana were successful, a figure that represents about the average for the entire mountain region.

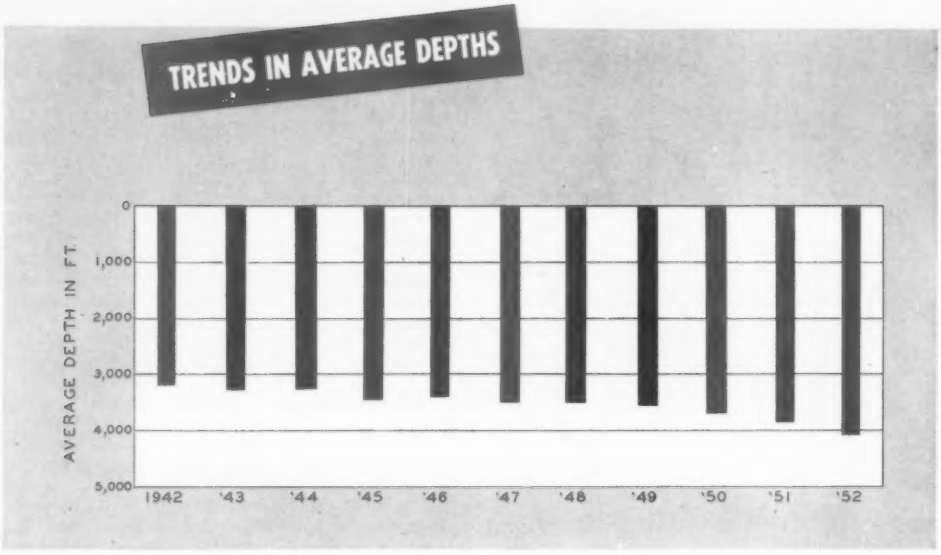
North Dakota's most active wildcatting area at the end of the year was in the northeastern section of the state in the Bottineau County area which borders Manitoba to the north, where 1952 brought four new important shallow discoveries in the Mississippian.

WILDCAT FOOTAGE DRILLED IN STATES WITH GREATEST WILDCAT ACTIVITY
(Thousands of feet)

State—	1952	1951	1950
Texas	23,444	21,130	15,888
Oklahoma	3,452	3,523	3,308
Louisiana	3,398	2,937	2,423
Kansas	3,292	3,659	2,859
California	2,772	2,306	1,763
Illinois	1,544	2,148	1,834
Mississippi	1,327	1,274	974
Colorado	1,278	735	236
Wyoming	858	696	596
Nebraska	795	637	485
Indiana	782	1,000	1,016
Michigan	642	777	797
Kentucky	605	610	447
All others	3,499	2,137	1,526
Total United States	47,688	43,569	34,152

WILDCAT COMPLETIONS BY STATES

State—	Comp.	Oil	Gas	Dry
Alabama	40	6	1	33
Arkansas	97	11	0	86
California	597	72	8	517
Colorado	245	19	10	216
Florida	10	0	0	10
Illinois	656	76	4	576
Indiana	424	39	4	381
Kansas	845	90	17	738
Kentucky	306	31	3	272
Louisiana	401	58	16	327
North	195	16	7	172
South	206	42	9	155
Maryland	35	0	22	13
Michigan	277	25	5	247
Mississippi	182	25	1	156
Missouri	10	0	3	7
Montana	98	12	0	86
Nebraska	187	12	5	170
New Mexico	165	48	4	113
New York	4	0	0	4
North Dakota	36	4	0	32
Ohio	41	2	8	31
Oklahoma	730	108	13	609
Pennsylvania	20	0	3	17
South Dakota	14	0	0	14
Texas	4,851	823	126	3,902
North Central (9)	1,048	212	11	825
West Central (7-B)	1,035	216	15	804
West (7-C & 8)	870	167	9	694
Panhandle (10)	80	5	7	68
Eastern (5 & 6)	252	25	4	223
Gulf Coast (2)	336	37	22	277
Gulf Coast (3)	390	73	14	303
Southwest (1)	348	21	4	323
Southwest (4)	492	67	40	385
Utah	50	3	1	46
West Virginia	14	0	5	9
Wyoming	173	21	6	146
Miscellaneous	63	3	3	57
Total 1952	10,571	1,488	268	8,815
Total 1951	10,302	1,531	259	8,512



NEW DEPTH RECORDS

Trend Is Still Towards Deeper Drilling

by John C. McCaslin

THE industry continued the trend toward deeper drilling in 1952. Drilling-depth records in 13 areas were broken during the year, and 10 areas reported new producing-depth records.

The records show that there were 1,041 wells drilled below 10,000 ft. in 1949, 1,225 in 1950, 1,322 in 1951, and 1,695 in 1952. This is still a relatively small fraction of all wells drilled, but the relationship of deep wells to total wells is increasing. In 1951 the total number of wells increased 2.9 per cent while wells between 10,000 and 12,500 ft. increased 11.8 per cent, and those deeper than 12,500 ft. increased 52.9 per cent. In 1952 the total number of wells increased 3 per cent while wells between 10,000 and 12,500 ft. increased 28 per cent. Wells drilled below 12,500 ft. increased 42.1 per cent in 1952.

The trend shows up at the other end of the scale, too. Between 1949 and 1950 the number of wells completed at less than 2,500 ft. showed a negligible percentage increase, but the figure dropped 6.5 per cent from 1950 to 1951. The figure dropped 4 per cent from 1951 to 1952.

In the below-15,000-ft. classification a total of 10 wells was completed in 1952. Alabama reported one well drilled below 15,000 ft., South Louisiana, five, Texas Gulf Coast two, and Southwest Texas two. The majority of the wells completed in the 10,000-12,500-ft. class were reported in South Louisiana, Texas, and California. A 33 per cent gain over 1951 was noted in the 7,500-10,000-ft. class. The 1952 figures reveal a 9 per cent gain in the number of wells completed in the 5,000-7,500-ft. classification. A slight decrease in the number of wells completed in the 2,500-5,000-ft. class plus the lower percentage of wells drilled in the below-2,500-ft. class indicates that deeper drilling is becoming more common each year.

In West Texas, particularly, a trend toward deeper drilling on and around older producing areas is reported. The rising importance of Ellenburger production in the Permian basin is adding new records continuously to the deeper depth classifications. Increased activity in the Anadarko basin, Williston basin, and the movement of drilling towards the center of the

DEPTH CLASSIFICATIONS BY MONTHS

	Under 2,500 ft.	2,500-5,000 ft.	5,000-7,500 ft.	7,500-10,000 ft.	10,000-12,500 ft.	12,500-15,000 ft.	Over 15,000 ft.
January	1,174	1,662	815	298	141	25	0
February	1,086	1,385	689	230	108	22	0
March	1,134	1,587	661	274	107	25	0
April	1,162	1,479	745	314	97	32	0
May	1,265	1,670	716	355	129	34	0
June	1,169	1,497	672	305	111	22	0
July	1,310	1,625	720	334	122	36	3
August	1,235	1,601	613	336	130	29	2
September	1,152	1,394	540	300	87	27	0
October	1,243	1,448	674	289	102	30	1
November	1,183	1,516	609	263	114	19	2
December	1,088	1,521	579	228	186	30	2
Total	14,201	18,385	8,033	3,526	1,354	331	10

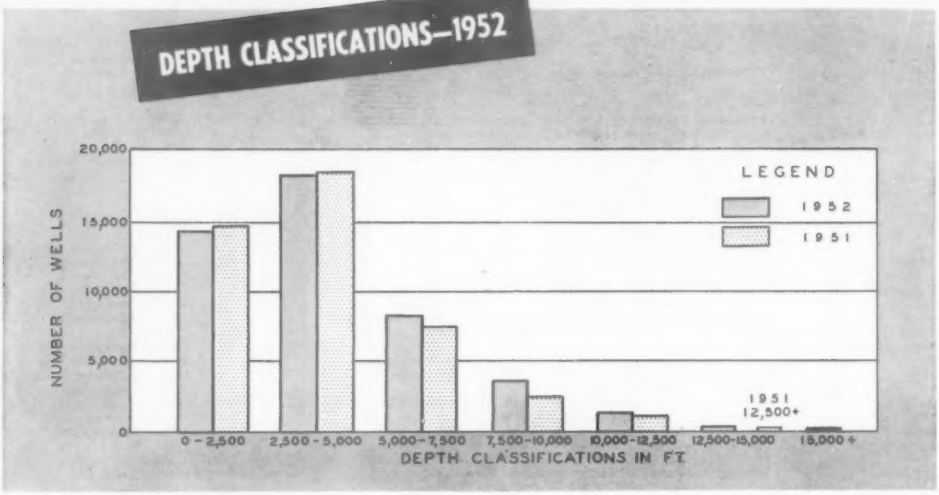
United States Drilling Depth Records

State or area—	Well and location; county	Result	Year comp.	Deepest formation	Total footage
Wyoming	Superior 1 Unit, 27-27n-103w; Sublette	Dry	1949	Dakota	20,521
Mississippi	Vassen 1 Fee, 9-2s-11w; Stone	S.D.			20,450
California	Superior 1 Limoneira, 9-2n-22w; Ventura	Dry	1949	U. Miocene	18,734
Louisiana, South	Magnolia 1-D Ragley Lumber Co., 29-5s-7w; Allen	Dry	1952		18,650
Texas, Southwest	Superior 27 Minnie S. Welder, Portilla field; San Patricio	Oil	1951		17,966
Oklahoma	Superior 51-11 Weller, 11-8n-12w; Caddo	Dry	1947	Pennsylvanian	17,823
Texas Gulf Coast	Phillips 3 Schoeps, Millican salt dome; Brazos	Dry	1945	Cretaceous	16,655
Texas, East	Humble 1 McWatters; Freestone	Oil	1949	Smackover	16,347
Texas, West	Gulf Oil Corp. 1 Mitchell, 40-1-TW&NG; Presidio	Drlg.			15,885
Alabama	Humble 1 Williams, 10-3n-2e; Clark	Oil	1952	Jurassic	15,729
Florida	Gulf 1 State; Monroe	Dry	1947		15,155
Colorado	Mountain Fuel 1 Hiawatha, 14-12n-100w; Moffat	Gas	1952	U. Cretaceous	15,041
New Mexico, Southeast	Humble 1 Federal-Wiggs, 31-24s-27e; Eddy	Dry	1950	Ellenburger	14,865
Texas, Panhandle	Gulf 1-E Porter "A," 413-43-H&TC; Lipscomb	Dry	1949	Ellenburger	14,278
North Dakota	Amerada 1 Risser, 12-149n-96w; McKenzie	Oil	1952	Red River (?)	13,779
Utah	Equity & Pacific Western 1 Unit, 33-21s-21e; Grand	Dry	1949	Pennsylvanian	13,767
Texas, North	Denver Prod. & Reig. 1 Rich, I&GN Sur. A-1439; Grayson	Dry	1951	Arbuckle (?)	13,352
New Mexico, Northwest	Continental 1 South Dulce, 6-28n-2w; Rio Arriba	Dry	1952		13,348
Louisiana, North	Union 1 McDonald Unit; Claiborne	Oil	1942	Smackover	12,953
Idaho	Phillips and Utah Southern 1 Juniper, 10-14s-30e; Oneida	Dry	1952		12,844
Arkansas	Shell 1 Browning-Burns Unit, 12-20s-23w; Columbia	Dry	1952	Smackover	12,650
Pennsylvania	California 1 Bennett; Sullivan	Dry	1951	Siluro-Ord.	12,321
Nevada	Continental and Cal-Standard 1 Unit, 32-20n-60e; White Pine	Dry	1952		11,543
Montana	Shell 1 Crow Tribal, 36-9s-37e; Big Horn	Dry	1949	Charles	11,519
Michigan	Ohio and Pure 1 Reinhardt, 35-22n-2e; Ogemaw	Dry	1948	Cambro-Ord.	11,012
Washington	Standard of Calif. 1 Alderwood; Snohomish	Dry	1947	Mid-Eocene	11,002
New York	N. Y. State Nat. Gas 1 Kesselring, Van Etten Twp.; Chemung	Drlg.		Sub-Silurian	10,953
North Carolina	Standard (Jersey) 1 Hatteras Light; Dare	Dry	1946	Granite	10,054
West Virginia	Hope Nat. Gas, 8517 Gribble Grant dist.; Harrison	Dry	1941	Queenston	10,018
South Dakota	Shell 1 Homme, 13-20n-12e; Perkins	Dry	1951	Granite	9,548
Oregon	Texas 1 Cooper Mountain, 25-1s-2w; Washington	Dry	1946		9,255
Kansas	Stanolind 1 Feathers, 15-35s-33w; Seward	Gas	1947	Crystalline	8,243
Maryland	Snee 1 Schartzer; Garrett	Dry	1941	Helderberg	8,165
Nebraska	Gulf 1 Miller, 7-12n-58w; Kimball	Oil	1951	Morrison	7,999
Ohio	Ohio 1-C Knowlton, Sec. 10, Indep. Twp.; Washington	Dry	1933	Clinton	7,889
Illinois	Superior 17 H. C. Ford "C" lease, New Harmony field; White	Oil	1952	Shakopee	7,882
Georgia	Stanolind 1 Pullen, Land Lot 133, Land Dist. 10; Mitchell	Dry	1944	Triassic	7,487
Arizona	Sinclair 1 Navajo, Cow Springs; Navajo	Dry	1952		7,211
Kentucky	Pure and Ashland 1-A Walker, 22-N-24; Webster	Dry	1949	Knox	6,686
Indiana	Continental 1 Cooper est., 13-3s-14w; Gibson	Dry	1947	Trenton	6,405
Tennessee	California 1 Beeler; Giles	Dry	1947	Granite	5,750
Iowa	Oil Development 1 Wilson; Page	Dry	1930	Pre-Cambrian	5,305
New Jersey	W. & K. 1 Mathews, Jackson Mills; Ocean	Dry	1929	Wissahickon	5,022
Missouri	Strake 1 Russell, 24-19n-11e; Pemiscot	Dry	1941	Cambrian	4,740
South Carolina	Parris Island water supply well; Beaufort	Dry	1940	Crystalline	3,454

United States Producing Depth Records

State or area—	Well and location; county	Result	Year comp.	Producing formation	Prod. depth
Alabama	Humble 1 Oswell, 15-3e-2n; Baldwin	Oil	1951	Tuscaloosa	5,425
Arkansas	Atlantic 1 McKamie-Patton C-216; Lafayette	Oil	1952	Smackover	9,453
California	Standard of California 5 Mushrush; Kern	Oil	1949	Eocene	15,530
Colorado	Delhi-El Paso 5 Barker, 2-32n-14w; La Plata	Gas	1950	Paradox	9,841
Florida	Humble 1 Gulf Coast, Sunniland field; Collier	*Oil	1943	Glen Rose	†11,626
Illinois	Kingwood 24-A Shanafelt, 20-2n-2e; Marion	Oil	1943	Trenton	4,657
Indiana	Lewis 1 Hill, 35-3s-14w; Posey	Oil	1939	McClosky	3,144
Kansas	Stanolind 1 Wall, 35-32s-23w; Clark	Oil	1951	Viola	6,576
Kentucky	United Carbon 1 Howe; Pike	Gas	1932	Devonian	5,170
Louisiana, North	James & Co. 2 Williamson, 28-23n-8w; Claiborne	Oil	1948	Smackover	10,789
South	Texas C-3 State, Bay St. Elaine field; Terrebonne	Oil	1952	Miocene	15,362
Maryland	Cumberland-Allegheny S-424 Beachy, Ryans Glade 8 Dist.; Garrett	Gas	1949	Oriskany	4,456
Michigan	Michigan Gulf 1 Bateson, Kawkawlin field; Bay	*Oil	1946	Salina	7,850
Mississippi	Union Producing et al. 1 Logan, Tinsley field; Yazoo	Cond.	1951	Smackover	14,427
Missouri	Cities Service 1 Cook, Tarkio field; Atchison	Oil	1944	Bartlesville	1,444
Montana	Texas NP "G" (NCT 4), 23-17n-53e; Dawson	Oil	1952	Devonian	9,953
Nebraska	Gulf 1 Sisson, 18-21n-58w; Kimball	Oil	1951	Dakota	7,431
New Mexico, Northwest	Southern Union 9 Barker Creek, 21-32n-14w; San Juan	Gas	1945	Pennsylvanian	9,468
Southeast	Buffalo 12-B Baish, 22-17s-32e; Lea	Oil	1952	Devonian	†13,626
New York	Kane 1 Lewis, West Union Twp.; Steuben	Gas	1942	Oriskany	5,228
North Dakota	Amerada 1 Risser, 12-149n-96w; McKenzie	Oil	1952	Madison	9,570
Ohio	East Ohio 1 Phillips, Sec. 23, Wash. Twp.; Harrison	Gas	1941	Silurian†	5,899
Oklahoma	Denver 1 School Land, 16-10n-9w, Cogar field; Caddo	Gas	1948	Hunton	14,510
Pennsylvania	American Locomotive 5 Steiner, Unity Twp.; Westmoreland	Gas	1946	Oriskany	8,014
Tennessee	York 2 Print Huff; Pickett	Oil	1947	Knox	1,702
Texas, East	Humble 1 Curtis, Larrissa field; Cherokee	Oil	1942	Pettit	10,312
Gulf Coast	Phillips 1-A Houston "B," Chocolate Bayou field; Brazoria	Gas	1952	Frio	12,847
North	Frank Weiner 1 Hazlip, Mineral Creek; Grayson	Cond.	1952	Mulder	10,160
Panhandle	Sinclair 10-J Lips, 2-1-BBB&C; Roberts	Gas	1952	Atoka	9,066
Southwest	Western Nat. Gas 14 St. Charles Ranch, Blackjack field; Aransas	Gas	1951	Frio	11,490
West	Phillips 1 Glenna, 28-101-TC; Pecos	Cond.	1952	Ellenburger	†14,522
Utah	Carter 1 Peterson, 13-1s-1w (USM); Uintah	Oil	1952	Wasatch	10,244
Washington	Hawksworth et al. 4 State, 15-18n-12w; Grays Harbor	‡Cond.	1951	Miocene	3,714
West Virginia	Ohio 1 Kuykendall et al. Dry Fork dist.; Tucker	Gas	1946	Oriskany	†8,410
Wyoming	Pure 1 Unit, 11-33n-64w; Natrona	Oil	1948	Frontier	14,307

*Now abandoned. †Total depth figure. ‡Now shut in.



Rocky Mountain basins is a major factor in the upsurge of wells being completed in the deeper categories. Deeper drilling in Oklahoma and Kansas, resulting from new discoveries in the Anadarko basin areas of those two states, is expected to continue increasing as new productive areas are uncovered. Last year's discoveries in the Sespe and Eocene formations in California have set off a wave of deep drilling in that state.

New Records

Drilling-depth records in 13 areas were broken during 1952 with Mississippi, New York, North Dakota, and South Louisiana reporting the most important new records.

Records in the Permian basin changed hands twice during the year. Earlier in 1952 Buffalo Oil Co.'s Baish well in Lea County, New Mexico, became the basin's deepest producer, producing oil from the Devonian at 13,626 ft. However, Phillips Petroleum Co. later completed its Glenna well in Pecos County, Texas, for gas in the Ellenburger at 14,522 ft.

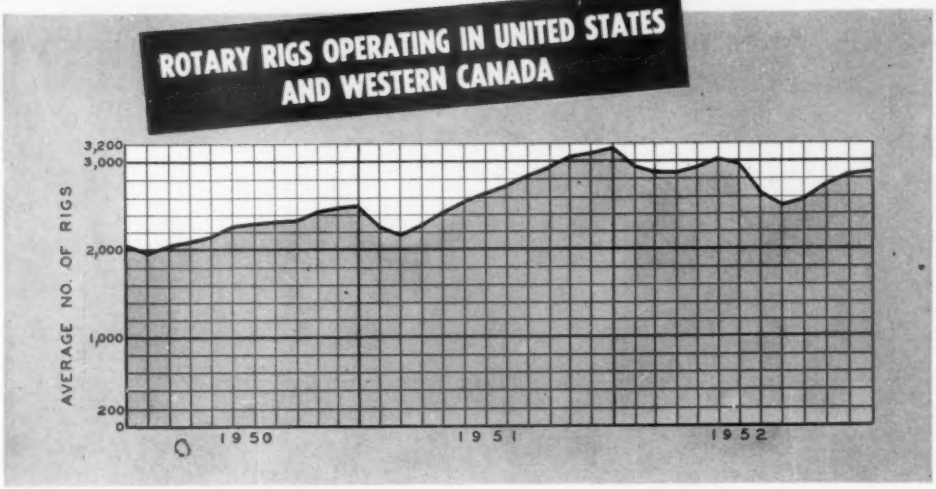
Average Depth Increases

A steady increase in the average depth of completed wells in the United States has been noted since 1947.

During 1952 the average depth of completed wells was 4,085 ft., 18 per cent higher than 1947. The average depth increase in 1952 over 1951 was 5.5 per cent. The deepest average depth for any one area in the country is South Louisiana. Average depth in that area is 10,034 ft. Average depth of North Dakota wells is 8,213 ft. As the recent discoveries in Bottineau County, North Dakota, are evaluated and developed the average depth in that state may possibly decline due to the more shallow production in that northeastern section of the Williston basin. Missouri has the lowest average depth for wells drilled, 983 ft. Texas average depth is 4,301 ft.

DEPTH CLASSIFICATIONS—1952

	Under 2,500 ft.	2,500-5,000 ft.	5,000-7,500 ft.	7,500-10,000 ft.	10,000-12,500 ft.	12,500-15,000 ft.	Over 15,000 ft.
Alabama	5	9	49	7	1	0	1
Arkansas	74	285	46	19	2	1	0
California	739	911	493	158	111	21	0
Colorado	24	133	310	17	1	1	0
Florida	0	1	5	3	1	0	0
Illinois	903	1,244	1	1	0	0	0
Indiana	1,060	217	0	0	0	0	0
Kansas	510	3,970	88	3	0	0	0
Kentucky	877	423	0	0	0	0	0
Louisiana	585	402	344	403	493	153	5
North	563	362	259	93	27	0	0
South	22	40	85	310	466	153	5
Marylaad	0	33	2	0	0	0	0
Michigan	396	287	24	0	0	0	0
Mississippi	0	27	234	55	27	5	0
Missouri	17	1	0	0	0	0	0
Montana	164	119	36	18	8	0	0
Nebraska	12	194	102	2	0	0	0
New Mexico	254	323	167	174	98	37	0
New York	764	3	0	0	0	0	0
North Dakota	1	12	31	69	6	3	0
Ohio	546	497	9	0	0	0	0
Oklahoma	1,683	2,764	969	255	105	5	0
Pennsylvania	1,647	99	137	1	0	0	0
South Dakota	12	2	0	0	0	0	0
Texas	3,492	5,821	4,690	2,252	485	101	4
North Central (9)	1,263	1,347	561	33	1	0	0
West Central (7-B)	730	1,213	392	0	0	0	0
West (7-C & 8)	468	1,227	2,115	873	195	70	0
Panhandle (10)	97	489	22	20	4	1	0
East (5 & 6)	35	309	267	157	13	4	0
Gulf Coast (2 & 3)	203	589	697	864	205	22	2
Southwest (1 & 4)	699	647	636	305	67	4	2
Utah	7	13	35	19	5	0	0
West Virginia	276	306	23	1	0	0	0
Wyoming	95	287	234	69	10	4	0
Miscellaneous	88	2	4	0	1	0	0
Total	14,201	18,385	8,033	3,526	1,354	331	10



AUGUST WAS LOW POINT

Shortages Reduce Number of Active Rigs

by Neil Williams

THE greatest number of rotary rigs reported operating in the United States and western Canada at any one time during 1952 was 3,032, or 149 short of equaling the previous year's all-time record of 3,181 rigs.

At the opening of 1952 prospects were that drilling activity during the year would reach new record levels. At midyear, when the year's "high" in number of operating rigs was recorded, it was well under way to doing so.

However, shortly after midyear the acute shortage of tubular goods resulting from the steel strike, started in June, forced a general curtailment of drilling programs, so, instead of the normally expected summer expansion of drilling activity, many rigs had to be shut down and stacked.

Late in August, the number of operating rigs had declined to 2,470, which was 562 under the midyear peak of 3,032 rigs, and, whereas the midyear number of active rigs was more than 400 greater than the number running at the same time the previous year, the August low of 2,470 rigs was more than 400 fewer than at that same time during 1951.

Low Average for Last Half

Easing up of the steel shortage after the end of the strike permitted resumption of drilling programs and during the remainder of the year a steadily increasing number of rigs were put back to work. Late in December, the number equaled, but did not exceed the midyear peak. Since then, there has been a sharp seasonal decline in active rigs.

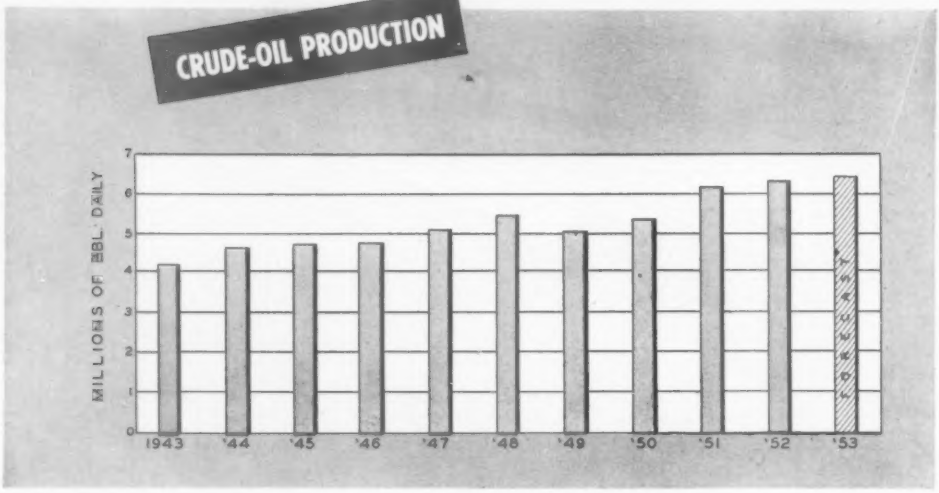
Greatest decline in number of operating rigs was in the West Texas area. Most of this was due to the substantial letup in exploration and development of Spraberry production. The Spraberry trend, scene of an intensive and widespread drilling play early in the year with several hundred rigs running, lost its attraction later in the year due to production problems and questionable recovery prospects.

On the other hand, substantial increases in drilling activity were recorded in the Rocky Mountains and western Canada, both of which areas set new records during the year in number of operating rigs. The Gulf Coast, Oklahoma, and Kansas areas also ended the year with more active rigs than at the start, although no new records were established.

Active exploration in the Williston basin of North Dakota and eastern Montana and in the Denver-Julesburg basin of western Nebraska and northeastern Colorado accounted for much of the substantial increase in number of operating rigs in Rocky Mountain region. At its peak, this region had more than 260 rigs running, 80 more than at the start of the year.

DISTRIBUTION OF ACTIVE ROTARY RIGS

	Dec. 31, 1952		Dec. 31, 1951		Dec. 31, 1950	
Area—	Rigs	% of total	Rigs	% of total	Rigs	% of total
Gulf Coast	649	23.1	643	21.0	567	23.6
N. & W. Tex.-N. M.	809	28.9	1,063	34.7	790	32.8
Ark.-N. La.-E. Tex.	146	5.2	191	6.2	154	6.4
Oklahoma	342	12.2	357	11.6	282	11.7
Kansas-S. Nebraska	172	6.1	171	5.6	136	5.7
Illinois-Eastern	117	4.2	126	4.1	119	4.9
Rocky Mountains	214	7.7	168	5.5	111	4.6
Pacific Coast	179	6.4	179	5.8	134	5.6
Total U. S.	2,628	93.8	2,898	94.5	2,293	95.3
Western Canada	173	6.2	168	5.5	113	4.7
Total	2,801	100.0	3,066	100.0	2,406	100.0



INCREASE ABOUT 2 PER CENT

New Production Record: 6¼ Million Barrels

by Philip C. Ingalls

PRODUCTION of crude oil and lease condensate in the United States climbed to a new all-time high during 1952 despite refinery and pipe-line strikes in May and a tight tubular-goods situation throughout most of the year.

Averaging 6,265,000 bbl. daily, crude-oil and lease-condensate production for the year was 127,000 bbl. daily higher than during 1951. Total production for the year amounted to 2,292,000,000 bbl., an increase of 52,550,000 bbl. This increase of 2.3 per cent (2.1 per cent allowing for the extra day in 1952) compares with 13.5 per cent between 1950 and 1951.

Daily average production in the United States exceeded 6,000,000 bbl. for each month of the year except May. During the month of May, because of refinery and pipe-line strikes, production dropped to an average of 5,107,800 bbl. daily. Texas, Oklahoma, Kansas, New Mexico, Colorado, and Wyoming were hardest hit by the refinery strikes. In Kansas, where pipe-line strikes hampered transportation to storage, production dropped from 334,000 bbl. daily in April to 160,500 bbl. daily in May.

During the strike period, those states affected by refinery strikes but whose pipe lines were not shut down, poured oil into storage. Crude-oil stocks in the United States at the end of May had climbed to 288,000,000 bbl., about 30,000,000 bbl. higher than considered necessary working stock. Crude stocks reached near-normal levels by August-September, but at the end of the year were climbing again at more than 270,000,000 bbl. The rapid buildup of stocks during May kept production at comparatively low levels during June and July (about 6,100,000 bbl. daily), but during August, production climbed to more than 6,200,000 bbl. daily and by November-December was at 6,600,000 bbl. daily.

State Records

Twelve states reached new all-time producing highs during 1952 (see accompanying table). Notable for a new record in production was Indiana. The previous record of 11,339,000 bbl. of oil was established in 1904.

Texas, which passed the 1-billion-barrel mark for the first time in 1951, produced 1,033,173,000 bbl. of crude oil and lease condensate (2,822,877 bbl. daily) during 1952 to account for 45 per cent of the total production in the United States.

In Texas, production allowables were raised in each of the first 3 months of the year and then given a small reduction in April. The strikes of May dropped Texas production to its lowest mark of the year—2,163,000 bbl. daily. Allowables in June and July were held down slightly to permit withdrawals from aboveground crude stocks which had been greatly increased during the strikes. Allowables were raised again from August through November, reaching an all-time high of 3,094,975 bbl. daily in November. Production increases in November resulted in such large additions to crude stocks that allowables were cut back in December.

California, second-biggest producing state in the country, came reasonably close to a dream average of 1,000,000 bbl. daily. The year's total for the state was 359,501,000 bbl. (982,000 bbl. daily). California's production reached 990,000 bbl. daily in December, a record high for the state. Demands in California have been greater than supply during most of the past 2 years. Early in 1952 the situation became critical; however, with the shifting of military purchases to Caribbean sources and some increases in imports from foreign areas, principally the East Indies, stocks were increasing at the end of the year.

United States Production of Crude Oil and Lease Condensate

(Thousands of barrels)

	1952 prod. change	1952	1951	1950	1949	1948	1947	1946	Cum. prod. 1857-1952
Alabama	+ 111	1,131	1,020	735	462	466	396	380	4,814
Arkansas	− 1,625	28,145	29,770	31,108	29,986	31,682	29,948	28,375	854,017
California	+ 5,034	359,501	354,467	327,607	332,942	340,074	333,132	314,713	9,333,566
Colorado	+ 2,406	29,631	27,225	23,303	23,587	17,862	15,702	11,856	203,850
Florida	− 3	593	596	487	441	290	259	68	2,769
Illinois	+ 1,357	59,564	58,207	62,028	64,501	64,808	66,459	75,297	1,624,087
Indiana	+ 1,260	11,857	10,597	10,699	9,696	6,974	6,095	6,726	223,177
Kansas*	+ 875	114,845	113,970	107,595	100,230	108,119	105,187	97,281	2,315,475
Kentucky†	+ 168	11,790	11,622	10,381	8,821	8,820	9,405	10,590	275,676
Louisiana	+ 7,976	239,814	231,838	208,965	190,826	181,458	160,128	143,669	3,032,668
Michigan	− 681	13,242	13,923	15,826	16,517	16,871	16,215	17,074	349,412
Mississippi	− 1,271	35,768	37,039	38,236	37,966	45,761	34,925	24,298	356,866
Montana	+ 703	9,625	8,922	8,109	9,118	9,382	8,742	8,825	186,798
Nebraska	− 349	2,059	2,408	1,547	330	215	229	279	11,851
New Mexico	+ 5,643	58,725	53,082	47,367	47,645	47,969	40,926	36,814	794,202
New York	− 48	4,206	4,254	4,143	4,425	4,621	4,762	4,863	185,599
North Dakota	+ 1,413	1,442	29						1,471
Ohio	+ 144	3,241	3,097	3,383	3,483	3,600	3,108	2,908	627,337
Oklahoma	+ 6,539	191,523	184,984	163,808	150,804	155,231	141,019	134,794	6,577,655
Pennsylvania	− 14	11,136	11,150	11,859	11,374	12,667	12,690	12,996	1,147,420
Texas	+23,045	1,033,173	1,010,128	829,874	744,834	903,498	820,210	760,215	15,766,160
Utah	+ 305	1,730	1,425	1,228	637	16			5,036
Virginia	− 1	11	12	21	43	33	61	12	199
West Virginia	− 118	2,625	2,743	2,808	2,839	2,692	2,617	2,929	446,328
Wyoming	− 319	67,613	67,932	61,631	47,890	55,032	44,772	38,977	1,051,343
Total U. S.	+52,550	2,292,990	2,240,440	1,972,748	1,839,397	2,018,141	1,856,987	1,733,939	45,377,776
Daily avg.	+ 127	6,265	6,138	5,405	5,039	5,514	5,088	4,751	

*Includes Missouri. †Includes Tennessee.

CRUDE-OIL PRODUCTION RECORDS BY STATES

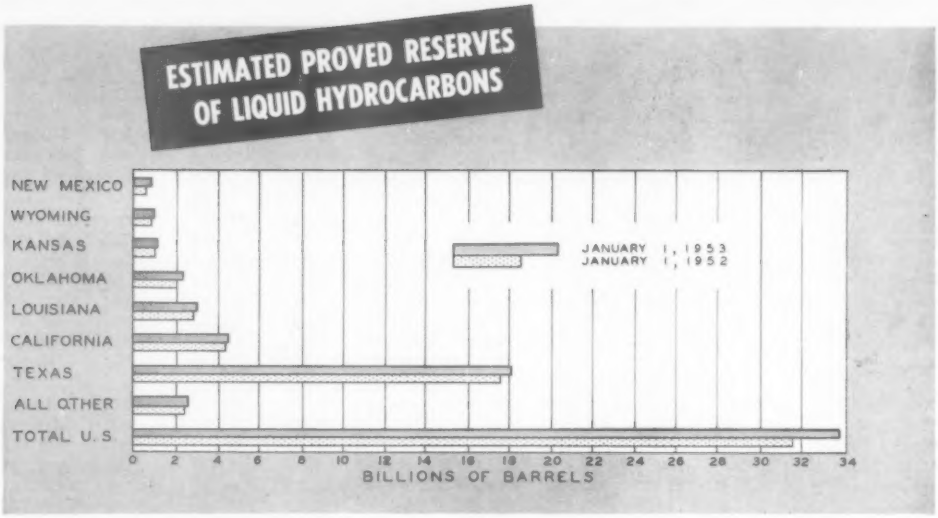
(Thousands of barrels)

	Record year	Production in record year
Alabama	1952	1,131
Arkansas	1925	77,398
California	1952	359,501
Colorado	1952	29,631
Florida	1951	596
Illinois	1940	147,647
Indiana*	1952	11,857
Kansas†	1952	114,845
Kentucky‡	1952	11,790
Louisiana	1952	239,814
Michigan	1939	23,462
Mississippi	1948	45,761
Montana	1952	9,625
Nebraska	1951	2,408
New Mexico	1952	58,725
New York	1882	6,685
North Dakota	1952	1,442
Ohio	1896	23,941
Oklahoma	1927	277,775
Pennsylvania	1891	31,424
Texas	1952	1,033,173
Utah	1952	1,730
Virginia	1947	61
West Virginia	1900	16,196
Wyoming	1951	67,932

*Previous record of 11,339,000 bbl. was set in 1904. †Includes Missouri. ‡Includes Tennessee.

PRODUCTION—DAILY AVERAGE PER WELL

	Bbl. daily 1952	Producing wells	Daily average per well
Alabama	3,090	96	32.2
Arkansas	76,899	3,996	19.2
California	982,243	30,853	31.8
Colorado	80,959	971	83.4
Florida	1,620	12	135.0
Illinois	162,743	33,734	4.8
Indiana	32,396	4,495	7.2
Kansas	313,724	32,076	9.8
Kentucky	32,188	15,806	2.0
Louisiana	655,230	13,605	48.2
Michigan	36,180	3,992	9.1
Mississippi	97,727	1,682	58.1
Montana	26,298	3,324	7.9
Nebraska	5,626	387	14.5
New Mexico	160,451	7,619	21.1
New York	11,492	17,635	0.7
North Dakota	3,940	85	46.4
Ohio	8,855	19,300	0.5
Oklahoma	523,287	60,247	8.7
Pennsylvania	30,426	56,660	0.5
Texas	2,822,877	136,976	20.6
Utah	4,727	61	77.5
West Virginia	7,172	15,000	0.5
Wyoming	184,735	4,880	37.9
Miscellaneous	115	145	0.8
Total United States	6,265,000	463,637	13.5



PROVED: 33,735,000,000 BBL.

Reserves Up Despite Record Withdrawals

by Philip C. Ingalls

ESTIMATES of proved reserves of crude oil and natural-gas liquids in the United States were higher at the beginning of 1953 than at the beginning of last year despite record withdrawals.

Estimates of total liquid hydrocarbons (crude oil and natural-gas liquids) considered recoverable by present producing practices from proved portions of known reservoirs were increased 1,939 million barrels net during 1952. Gross increase was 4,490 million barrels from which 1952's record-breaking production of 2,551 million barrels must be subtracted.

By far a majority of this large increase in remaining reserve estimates is attributable to fields discovered prior to 1952. Reserve estimates for 1952 discoveries are conservative. Future years will see estimates of last year's discoveries increased as development drilling expands productive areas and production history indicates higher unit recoveries than can now be justifiably assigned.

Estimates of proved remaining reserves do not include oil believed to be recoverable by fluid-injection methods unless those methods have been applied and definite results indicated. Neither do the estimates include oil that may be produced by processing oil shales. Furthermore, these estimates are based on existing economic conditions.

Crude Oil

Proved reserves of crude oil in the United States as of January 1, 1953, are estimated at 29,044 million barrels, 1,507 million barrels more than estimated for the beginning of 1952.

Texas accounted for 439 million barrels of the 1,507-million-barrel increase. Of the total Texas increase, 307 million barrels was credited to West Texas. Estimated ultimate recovery for the much-discussed Spraberry trend was held at only 225 million barrels for that area south of the north line of Midland County (except Benedum) in Texas Railroad Districts 7C and 8. This estimate appears reasonable at present, but future years are expected to see considerable growth in Spraberry reserve estimates.

ESTIMATED PROVED RESERVES OF TOTAL LIQUID HYDROCARBONS IN THE UNITED STATES
(Millions of barrels)

State—	Jan. 1, 1953	Jan. 1, 1952	Change
Arkansas	335	347	— 12
California	4,529	4,347	+ 182
Colorado	316	271	+ 45
Illinois	611	564	+ 47
Kansas	1,170	1,060	+ 110
Kentucky	77	77	0
Louisiana	3,050	2,940	+ 110
Michigan	81	91	— 10
Mississippi	460	459	+ 1
Montana	175	129	+ 46
New Mexico	930	720	+ 210
Oklahoma	2,280	2,010	+ 270
Pennsylvania	125	98	+ 27
Texas	18,204	17,465	+ 739
West Virginia	74	79	— 5
Wyoming	985	920	+ 65
Others	333	219	+ 114
Total United States	33,735	31,796	+1,939

Estimated Proved Reserves of Crude Oil In The United States

(Thousands of barrels)

State—	Proved reserves 1-1-52	1952 discoveries	Extensions and revisions	1952 production	Proved reserves As of 1-1-53	Year's change	Per cent of U. S.
Alabama	4,000	4,000	3,131	1,131	10,000	+ 6,000	
Arkansas	295,000	2,000	15,917	27,917	285,000	— 10,000	1.0
California total	4,007,000	58,000	459,501	359,501	4,165,000	+ 158,000	14.3
Coastal	760,000	30,000	135,822	83,822	842,000	+ 82,000	2.9
Los Angeles	1,177,00	8,000	157,442	123,442	1,219,000	+ 42,000	4.2
San Joaquin	2,070,000	20,000	166,237	152,237	2,104,000	+ 34,000	7.2
Colorado	255,000	4,000	70,631	29,631	300,000	+ 45,000	1.0
Florida	3,000	0	1,593	593	4,000	+ 1,000	
Illinois	538,000	3,000	103,564	59,564	585,000	+ 47,000	2.0
Indiana	58,000	1,000	7,857	11,857	55,000	— 3,000	0.2
Kansas-Missouri	910,000	30,000	184,845	114,845	1,010,000	+ 100,000	3.4
Kentucky-Tennessee	65,000	1,000	10,790	11,790	65,000	0	0.2
Louisiana total	2,310,000	35,000	285,403	230,403	2,400,000	+ 90,000	8.2
North	430,000	5,000	53,436	41,436	447,000	+ 17,000	1.5
South	1,880,000	30,000	231,967	188,967	1,953,000	+ 73,000	6.7
Michigan	90,000	1,000	2,242	13,242	80,000	— 10,000	0.2
Mississippi	405,000	6,000	28,335	34,335	405,000	0	1.4
Montana	125,000	30,000	24,625	9,625	170,000	+ 45,000	0.6
Nebraska	18,000	3,000	—941	2,059	18,000	0	
New Mexico	625,000	50,000	163,608	58,608	780,000	+ 155,000	2.7
New York	57,000	0	206	4,206	53,000	— 4,000	0.2
North Dakota	20,000	35,000	70,442	1,442	124,000	+ 104,000	0.4
Ohio	27,000	0	2,241	3,241	26,000	— 1,000	0.1
Oklahoma	1,735,000	10,000	426,523	191,523	1,980,000	+ 245,000	6.8
Pennsylvania	96,000	0	37,136	11,136	122,000	+ 26,000	0.4
Texas total	14,965,000	210,000	1,246,756	1,017,756	15,404,000	+ 439,000	52.9
East	3,130,000	3,000	66,298	159,298	3,040,000	— 90,000	10.4
Gulf Coast	3,220,000	40,000	257,065	225,065	3,292,000	+ 72,000	11.3
North	925,000	25,000	258,579	98,579	1,110,000	+ 185,000	3.8
Panhandle	320,000	2,000	52,195	29,195	345,000	+ 25,000	1.2
Southwest	1,485,000	35,000	10,855	105,855	1,425,000	— 60,000	4.9
West	5,885,000	105,000	601,764	399,764	6,192,000	+ 307,000	21.3
Utah	30,000	4,000	7,730	1,730	40,000	+ 10,000	0.1
West Virginia-Virginia	39,000	0	1,636	2,636	38,000	— 1,000	0.1
Wyoming	860,000	15,000	117,613	67,613	925,000	+ 65,000	3.8
Total United States	27,537,000	502,000	3,271,384	2,266,384	29,044,000	+1,507,000	100.0

Estimated Proved Reserves Of Natural-Gas Liquids In The United States

Includes Condensate, Natural Gasoline, and Liquefied Petroleum Gases

(Thousands of barrels)

State—	Proved reserves 1-1-52	1952 discoveries	Extensions and revisions	1952 production	Proved reserves As of 1-1-53	Year's change	Per cent of U. S.
Arkansas	52,000	75	727	2,802	50,000	— 2,000	1.1
California	340,000	3,500	50,013	29,513	364,000	+ 24,000	7.8
Colorado	16,000	100	388	488	16,000	0	0.3
Illinois	26,000	20	3,507	3,527	26,000	0	0.6
Kansas	150,000	400	14,011	4,411	160,000	+ 10,000	3.3
Kentucky	12,000	50	4,443	4,493	12,000	0	0.3
Louisiana	630,000	8,000	46,818	34,818	650,000	+ 20,000	13.9
Michigan	1,100	5	—20	85	1,000	— 100	
Mississippi	54,000	1,000	4,092	4,092	55,000	+ 1,000	1.2
Montana	3,500	2,000	—289	211	5,000	+ 1,500	0.1
New Mexico	95,000	10,000	53,639	8,639	150,000	+ 55,000	3.2
Ohio	1,600	10	34	44	1,600	0	
Oklahoma	275,000	2,500	49,999	27,499	300,000	+ 25,000	6.4
Pennsylvania	2,500	35	217	252	2,500	0	0.1
Texas	2,500,000	30,000	425,698	155,698	2,800,000	+300,000	59.6
West Virginia	40,000	100	1,209	5,309	36,000	— 4,000	0.8
Wyoming	60,000	1,000	1,752	2,752	60,000	0	1.3
Others	800	65	1,371	336	1,900	+ 1,100	
Total United States	4,259,500	58,860	657,609	284,969	4,691,000	+431,500	100.0

Giant Fields* vs. All Fields

Crude, Condensate, and Cycled Products
(Millions of barrels)

State—	Number giants	1952 production: All fields	1952 production: Giant fields	1952 production: Giants' per cent	Estimated ultimate†: All fields	Estimated ultimate†: Giant fields	Estimated ultimate†: Giants' per cent	Remaining reserves: All fields	Remaining reserves: Giant fields	Remaining reserves: Giants' per cent
Texas	64	1,062.75	556.71	52.4	32,040	20,428	63.8	16,029	10,079	62.9
California	34	361.34	263.02	72.8	13,600	11,020	81.0	4,215	3,099	73.5
Oklahoma	22	191.52	95.27	49.7	8,558	4,640	54.2	1,980	1,110	56.1
Louisiana‡	15	252.74	74.30	29.4	5,687	2,030	35.7	2,645	785	29.7
Kansas	5	114.85	26.27	22.9	3,322	930	28.0	1,010	279	27.6
Colorado	1	29.63	22.35	75.4	504	340	67.5	300	220	73.3
New Mexico	4	58.73	22.32	38.0	1,542	785	50.9	780	351	45.0
Illinois	5	59.56	19.23	32.3	2,195	1,215	55.4	585	266	45.5
Wyoming§	4	67.61	17.74	26.2	1,978	925	46.8	925	356	38.5
N. Y.-Pa.	2	15.34	12.84	83.7	1,508	851	56.5	175	154	88.0
Mississippi	3	37.45	12.11	32.3	790	390	49.4	445	190	42.7
Arkansas	3	29.37	9.94	33.8	1,175	700	59.6	300	124	41.3
Montana	1	9.63	2.76	28.7	358	110	30.7	170	37	21.8
North Dakota	1	1.44	1.42	98.3	125	124	99.2	124	123	99.2
Other states	0	48.28	0	0	2,282	0	0	336	0	0
Total U. S.	164	2,340.24	1,136.28	48.6	75,664	44,488	58.8	30,019	17,173	57.2

*Fields with estimated ultimate recovery of 100 million barrels or more. †Accumulated production to January 1, 1953, plus estimated proved reserves. ‡Includes all of Rodessa field. §Includes all of Elk Basin field.

California's year-end increase was estimated at 158 million barrels, giving the state its best year since Cuyama Valley was opened in 1948-1949. Discoveries in Ventura County and in the San Joaquin Valley are expected to have excellent growth potentialities.

Oklahoma's increase of 245 million barrels of crude oil came principally from revisions to prior-year discoveries; however, wildcatting in the far western parts of the state during 1952 gave indications that the next few years may see significant new developments in that area.

Crude-oil reserves in Kansas, long subject to conservative estimates by many observers, were increased another 100 million barrels because of extensions, performance of older fields, and a large number of modest discoveries.

Of the newer areas contributing to the increase in crude-oil reserve estimates, the Williston basin was unquestionably the most interesting. Estimates of reserves here were kept conservative. In North Dakota only the Madison on the Nesson anticline can be considered as having proved reserves of significance. In the eastern Montana portion of the basin, development drilling has been too limited to assign more than token reserves to this promising area.

Lea County, New Mexico, was another relatively new area of exploratory drilling that added significantly to reserves. Here again, because of the lack of production history and limited development, reserve estimates are unquestionably conservative.

Natural-Gas Liquids

The American Gas Association's committee on natural-gas reserves defines natural-gas liquids as those liquids which "are gaseous in the reservoir but are obtainable by condensation or absorption" and further, that they "are those heavier hydrocarbon components of natural gas which may be removed and reduced to the liquid state by various processes."

Natural-gas liquids include natural gasoline, condensate, and liquefied petroleum gases which are collected at field separators, scrubbers, gasoline plants, or cycling plants.

Recoverable reserves of natural-gas liquids in the United States are estimated at 4,691 million barrels at the beginning of 1952, 431.5 million barrels higher than the estimate of 1 year ago. This estimate includes an allowance for those liquids that would be available if still-greater volumes of wet gas now being produced were processed.

Giant Fields

Of the estimated 75.7 billion barrels of oil (crude, lease condensate, and cycled products) discovered in the United States to the end of 1952, 58.8 per cent of it is credited to only 164 fields.

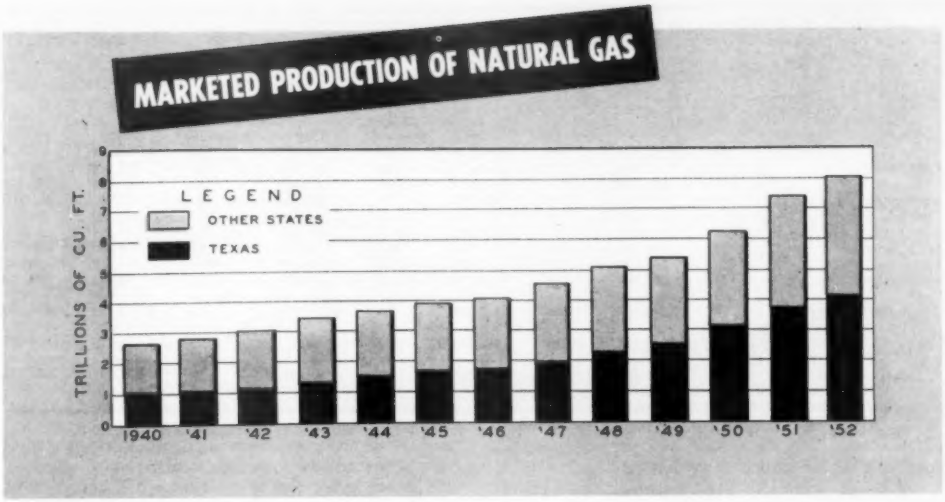
Beginning on page 289 of this issue are detailed the 1952 production, accumulated production as of January 1, 1953, and estimates of the proved remaining reserves of the larger producing fields in the United States. In those tabulations the 164 giant fields have been marked with asterisks.

SUMMARY OF PROVED RESERVES OF CRUDE OIL AS ESTIMATED BY THE AMERICAN PETROLEUM INSTITUTE, 1946-1951

(Thousands of barrels)

	Production during year	Estimated reserves at end of year
1946	1,726,348	20,873,560
1947	1,850,445	21,487,685
1948	2,002,448	23,280,444
1949	1,818,800	24,649,489
1950	1,943,776	25,268,398
1951	2,214,321	*27,468,031

*The Oil and Gas Journal's independent estimate was 27,537,000,000 bbl. as of January 1, 1952 (see table on page 205 for detail by states).



MARKET STILL EXPANDING

Natural-Gas Production Should Rise 8 Per Cent

by Joseph A. Kornfeld

MARKETED natural-gas production in the United States during 1953 should reflect a continued rise of about 8 per cent per year. Total production should approach 8.7 trillion cubic feet. More than 84 per cent of this volume will continue to be supplied from the southwestern states comprising Texas, Louisiana, Oklahoma, Kansas, and New Mexico. Texas alone will supply more than one-half of the total annual requirements for the United States.

Gulf Coast . . . A high volume of exploratory and developmental drilling for natural gas-distillate reserves is predicted for the Gulf Coast region of Texas and Louisiana. Important reserves are being developed in the Miocene basins around the Mississippi River Delta region of southeastern Louisiana and in thick gas sands of highly faulted reservoirs in southwestern Louisiana. Important deep gas fields are being developed in the Frio sands in the Rio Grande embayment of South Texas.

Mid-Continent . . . The Anadarko basin of western Oklahoma, Oklahoma Panhandle, and Texas Panhandle is expected to yield a number of significant gas-distillate fields from deep Pennsylvanian and Mississippian reservoirs during the next few years. This additional supply will augment the constantly expanding requirements of a cluster of major natural-gas transmission lines originating from the Mid-Continent region.

The Kansas sector of the tristate Hugoton gas field will see a steady volume of outpost drilling which will raise the daily deliverability materially beyond the present 4-billion-cubic-foot mark. Peak deliverability of about 5 billion cubic feet is anticipated during 1954.

Rocky Mountains . . . In the intermontane basins of the vast Rocky Mountain province, a number of 10,000-ft. drilling rigs, now active in the region, should find important gas-distillate reserves in deep Cretaceous sandstones as well as in the Embar-Tensleep (Permo-Pennsylvanian) reservoirs.

The rapidly mounting volumes of solution gas produced from the Mississippian and other lower Paleozoic oil reservoirs in the Nesson anticline area of North Dakota will soon reach proportions to economically justify construction of a natural-gasoline plant. Residue gas made available by this projected move should help to alleviate the natural-gas shortage existing in the north-central United States. Montana is currently an important state. It receives up to 50,000 M.c.f. of gas per day from the Pakowki-Manyberries gas fields of southeastern Alberta through an arrangement with the Alberta provincial and the Canadian commonwealth governments.

The important drilling campaign for natural gas in progress in the four-state San Juan basin, principally from shallow Cretaceous sandstones, will continue at a high level during 1953 to serve the existing El Paso Natural Gas Co. transmission line extending to the West Coast and new major transmission lines projected with their origin in the gas fields of this broad basin.

New 1953 Construction

During 1953, the natural-gas industry will spend more than 1.57 billion dollars for new construction, an increase of about 50 per cent over expenditures for new construction during 1952, the American Gas Association predicts. These expenditures will be devoted to expansion of production, transmission, underground storage, and distribution facilities for natural gas.

For the 5-year period from 1952 through 1956, the natural-gas industry will spend more than 5.6

GROWTH OF MARKETED PRODUCTION OF NATURAL GAS IN THE UNITED STATES BY STATES FOR VARIOUS YEARS FROM 1940-1952

(All volumes in millions of cubic feet)

State—	1952	Per cent change over 1951	1951	Per cent change over 1950	1950	Per cent change over 1946	1946	1940
Texas	4,193,900	+10.9	3,781,136	+20.9	3,126,402	+ 76.0	1,776,148	1,063,538
Louisiana	1,112,400	+ 5.5	1,054,199	+26.8	831,701	+ 58.4	525,178	343,191
Oklahoma	653,500	+21.3	538,756	+11.7	482,360	+ 26.6	380,938	257,626
California	507,900	−10.4	566,751	+ 1.5	558,398	+ 14.4	487,904	351,950
Kansas	415,200	− 0.6	417,538	+14.7	364,024	+ 119.7	165,725	90,003
New Mexico	362,000	+20.6	300,169	+41.0	212,909	+ 78.5	119,262	63,990
West Virginia	166,200	−13.1	191,146	+ 0.6	189,980	+ 6.2	178,958	188,751
Mississippi	164,700	+ 3.7	158,845	+39.2	114,153	+1,480.0	7,225	6,365
Pennsylvania	104,900	−18.5	128,715	−32.7	191,137	+ 106.8	92,443	90,725
Subtotal 9 states	7,680,700	+ 7.6	7,137,255	+17.6	6,071,134	+ 62.6	3,733,781	2,456,139
Others	336,900	+ 5.2	320,104	+51.8	210,926	− 28.9	296,824	204,083
Total United States	8,017,600	+ 7.5	7,457,359	+18.7	6,282,060	+ 55.9	4,030,605	2,660,222

billion dollars for the construction of new facilities and expansion of present plant facilities.

Although several major natural-gas transmission pipe lines are planned for 1953, most of the expansion effort in the natural-gas industry will consist of looping present lines and increasing the horsepower capacity of compressor stations on main lines. Considerable sums will be expended for compressor stations in conjunction with underground natural-gas-storage reservoirs.

During 1952 the natural-gas-facilities construction program slowed down to an estimated 1.170 billion dollars for the year due to shortages of steel and delays in obtaining the necessary certificates of necessity from the Federal Power Commission. This figure compares with the record high level of 1.462 billion dollars expended during 1951.

FPC authorizations during 1952 were only for 5,000 miles of natural-gas pipe line, whereas 5,800 miles of natural-gas pipe lines received FPC approval during 1951.

Output Hits New Peak in 1952

Marketed production of natural gas in the nation climbed during 1952 to an estimated 8.018 trillion cubic feet. This is a gain of 7.5 per cent over the 1951 total figure of 7.457 trillion cubic feet.

Texas . . . More than 52 per cent of the 1952 marketed natural-gas production came from Texas and 4.194 trillion cubic feet was produced from the state during the year. This output represents a rise of 10.9 per cent over the 1951 figure of 3.781 trillion cubic feet.

At the end of World War II, before the bulk of the major natural-gas-transmission lines of the Gulf Coast were constructed, Texas marketed only 1.776 trillion cubic feet in 1946. Back in 1940, only 1.063 trillion cubic feet was produced annually from Texas, which is about one-fourth of the 1952 annual figure.

Louisiana . . . The Pelican state produced and marketed 1.112 trillion cubic feet of gas during 1952 or 5.5 per cent over 1951. The 1952 annual figure for Louisiana is almost twice the state's 1946 annual output when 525 billion cubic feet was marketed. During 1940, only 343 billion cubic feet of Louisiana gas found a market.

Oklahoma . . . The Sooner state marketed 653 billion cubic feet of gas during 1952, a gain of 21.3 per cent over 1951. Last year's annual figure was a considerably higher volume than Oklahoma's annual output of 381 billion cubic feet in 1946 and 258 billion cubic feet for 1940.

California . . . This West Coast state slumped in marketed natural-gas production during 1952. Last year this drop was 10.4 per cent below the 1951 figure. California receives major gas supplies from El Paso Natural Gas Co. transmission lines originating in the San Juan basin and in the West Texas Permian basin.

Kansas . . . Production marketed principally from the Kansas sector of the tristate Hugoton gas field accounted for most of the output of the Sunflower state during 1952. The 1952 figure was 415 billion cubic feet and the 1951 volume totaled 417 billion cubic feet.

New gas-field discoveries in southwestern Kansas lying at depths below the 2,800-ft. Permian Hugoton gas field will contribute materially to future gas supplies in this state.

New Mexico . . . New gas supplies are being found in New Mexico principally from the Cretaceous sandstones in the San Juan basin in its northwestern counties. In addition, the westward extension of the Permian basin into Lea, Eddy, and Chaves counties in the southeastern corner of the state are productive of gas in the Permian and Pennsylvanian reservoirs. As a consequence of these combined developments, marketed gas production in New Mexico continued its upward movement. During 1952 marketed production was 362 billion cubic feet or 20.6 per cent over the 1951 figure of 300 billion cubic feet.

Natural-Gas Consumption

Total utility sales of gas in 1952 amounted to 52,557,000,000 therms, an increase of 9.0 per cent over 48,221,800,000 therms sold during 1951.

Natural-gas utility sales totaled 49,192,000,000 therms during 1952, up 10.0 per cent from the previous year. On the other hand, manufactured and mixed-gas sales were down 3.8 per cent during 1952 below 1951's total of 3,826,000,000 therms. (A therm is 100,000 B.t.u.'s and is the equivalent to 100 cu. ft. of natural gas with a heating value of 1,000 B.t.u.'s per cubic foot).

The A.G.A. figures take no account of natural gas sold to other than utility customers.

Revenues . . . Total revenues from utility gas sales

reached $2,455,022,000 in 1952, a gain of 10.2 per cent over the $2,208,109,000 sales total in 1951.

Natural-gas revenues were $1,951,735,000 in 1952; this was a rise of 17.1 per cent over the previous year.

Because of the sizable volume of changeovers in important consuming areas, revenues from manufactured and mixed-gas sources dropped 10.9 per cent to total $481,042,000 in 1952.

Customers . . . At the end of 1952, the gas-utility companies were servicing 27,019,000 customers; this includes about 314,000 L.P.G. customers which are serviced directly by gas-utility companies. This marked a gain of 1,523,000 customers, which is an increase of 6.0 per cent over the 25,496,000 customers located on gas-utility lines at the end of 1951.

Natural-gas utility companies serviced more than 20,028,000 customers at the end of 1952. This is a gain of 16.2 per cent over the 1951-year-ending figure of 17,239,000 natural-gas customers. The continued growth of natural-gas transmission and distribution systems resulted in a consequent slump in the number of customers formerly serviced by manufactured and mixed gas. Thus manufactured and mixed-gas customers totaled 6,677,000 at the end of 1952, a decline of 16.0 per cent under 7,948,000 customers a year earlier.

Underground Gas Storage

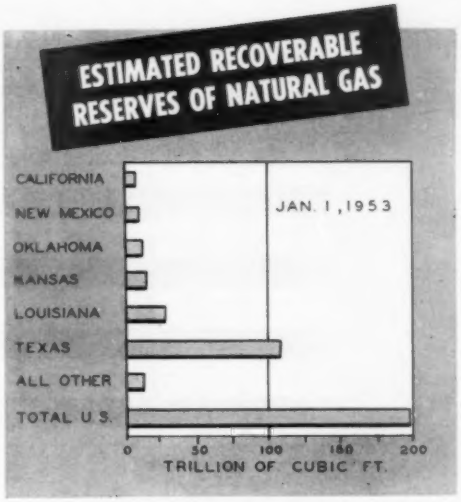
The trillion-cubic-foot mark in the combined capacities of underground natural-gas reservoirs in the United States was reached during 1952.

The phenomenal growth in underground-storage projects during the past few years is reflected in the fact that total storage capacity in existence today has nearly doubled over that in operation at the end of 1949. Cumulative capacity of these storage projects rose to 744 billion cubic feet at the end of 1950 and reached 916 billion cubic feet at the beginning of 1952.

Total capital expenditures for underground storage purposes was approximately 170 million dollars at the beginning of 1952, according to the A.G.A. report; physical properties and cushion or base gas in storage are included in this figure.

ESTIMATED PROVED RESERVES OF NATURAL GAS IN THE UNITED STATES
(Billion cubic feet at 60° F. and 14.65 psia.)

State—	Jan. 1, 1953	Jan. 1, 1952	Change
Arkansas	930	900	+ 30
California	9,500	9,700	− 200
Colorado	1,400	1,300	+ 100
Illinois	225	225	0
Indiana	30	30	0
Kansas	15,000	15,000	0
Kentucky	1,300	1,350	− 50
Louisiana	30,000	28,000	+2,000
Michigan	200	200	0
Mississippi	2,600	2,500	+ 100
Montana	800	800	0
New Mexico	10,000	7,500	+2,500
New York	65	65	0
Ohio	650	640	+ 10
Oklahoma	12,000	12,000	0
Pennsylvania	800	900	− 100
Texas	107,000	106,000	+1,000
Utah	80	65	+ 15
West Virginia	1,700	1,700	0
Wyoming	2,500	2,400	+ 100
Others	200	85	+ 115
Total United States	196,980	191,360	+5,620



Gas in Storage Rises

Natural gas in underground storage at the beginning of 1952 totaled more than 474 billion cubic feet, the A.G.A. reports. This marks a gain of 134 billion cubic feet over conditions existing at the beginning of 1951.

Appalachians Big Storage Area

The Appalachian region, lying in the highly industrialized East with a paucity of sufficient natural-gas reserves of its own, claims the principal underground storage fields of the nation.

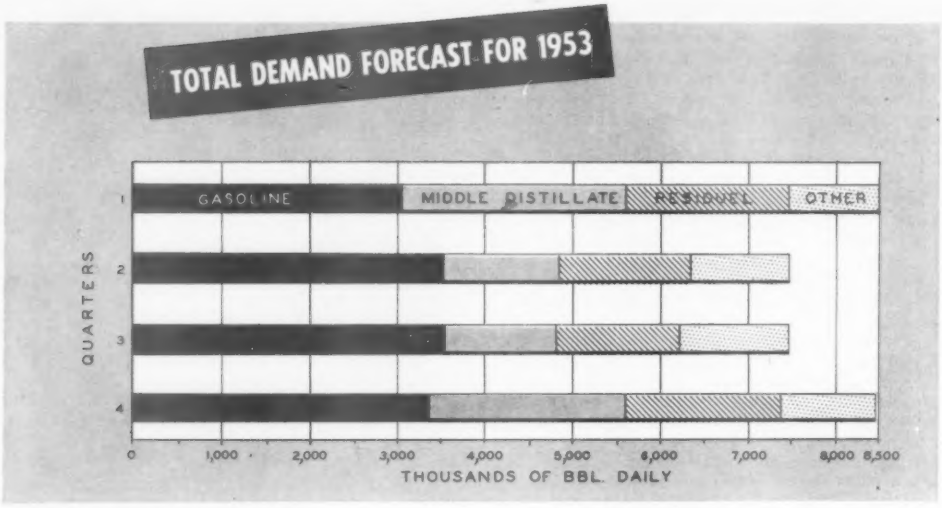
More than one-third of all the underground natural-gas storage fields in the United States are located in Pennsylvania; on January 1, 1952, Pennsylvania had 51 storage pools with 1,143 active wells with a combined ultimate reservoir capacity of more than 178 billion cubic feet. Based on number of storage pools, West Virginia is the nation's second leading state with 22 storage pools.

New York state is third with 14 storage pools in operation at the beginning of last year. Ohio with 10 storage pools had over 160 billion cubic feet of ultimate reservoir capacity on January 1, 1952, exceeded only by Pennsylvania.

Natural-Gas Reserves

Estimated proved reserves of dry natural gas in the United States increased 5,620 billion cubic feet to a total of nearly 197 trillion. Texas, Louisiana, Kansas, Oklahoma, and New Mexico continue to dominate the gas-reserves picture.

These tabulated estimates are for developed reserves, most of which are being depleted. However, not all of the produced gas is being utilized.



DEMAND DUE TO LEVEL OFF

U. S. Needs Forecast as 7,647,000 Bbl. Daily

by John C. Casper

TOTAL Free World demand for crude and petroleum products in 1953 is expected to increase about 6.1 per cent over the average for 1952. Total consumption, forecast for the Western Hemisphere, represents an increase of 5.3 per cent.

Domestic demand in the United States for petroleum products is forecast at 7,647,900 bbl. daily for 1953, representing a gain over 1952 of about 367,000 bbl. daily or 5.0 per cent.

Exports of crude and products from this country are expected to decrease about 23.5 per cent in 1953. This is a continuation of the trend that cut 1952 exports to the small gain of 0.3 per cent over 1951.

These forecasts assume that there will not be any major expansion in military operations in 1953 and that the rate of increase in military demands for petroleum products may level off; that the Abadan refinery will not be operated during the year, but that new foreign refining capacity will be able to supply the markets that were formerly served from Iran; that there will be some leveling off in general business activities; and that the weather will follow the so-called "normal" pattern.

The major influencing factor in the economic cycle covering the next few years will be military demand. It has been forecast that military purchases will tend to reach a peak sometime in 1953 but will continue for an indefinite time at or near the peak level. The moderate loss in general industrial activity that has been talked about for 1953 and 1954 is based on the assumption that there will be no need for any further large expansion in industrial capacity to meet total military demands for the next few years. Since the portion of total production going into plants and equipment has been abnormally high for the past few years because of rapid gains in military requirements, the completion of that part of the over-all capacity expansion program required to meet increased military demands will free some production for normal civilian consumption. Unless this civilian demand increases faster than is expected, there will be a reduction in the production of total goods before the end of this year.

The general outlook for 1953 is for further increases in the first half of the year with a leveling off and perhaps a decrease in the last half or at least in the last quarter. This is so universally accepted that the planning for a decline in general business activity may influence timing and intensity of the cycle.

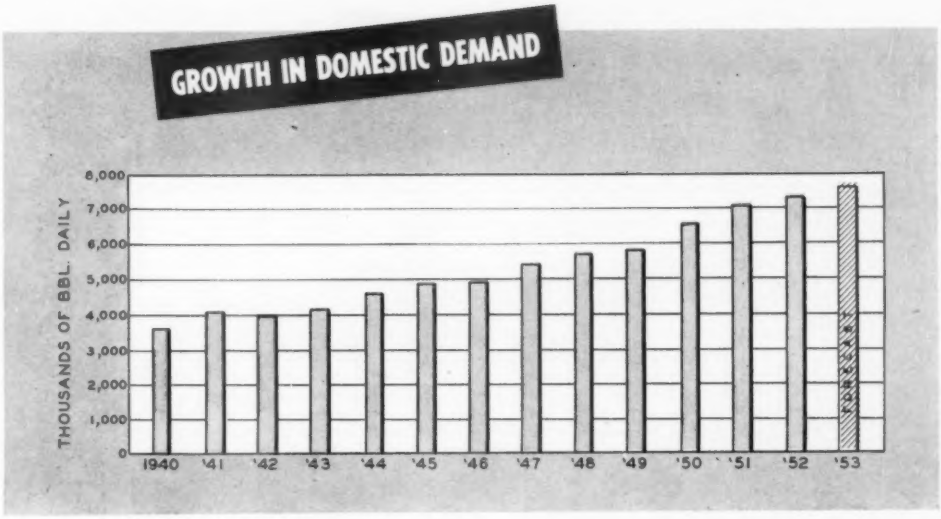
Distillate Fuels Up 7.2 Per Cent

Domestic demand for distillate fuels increased 7.2 per cent in 1952 for the largest relative increase in the major-product group. These fuels are expected to repeat in 1953 with a gain of 8.3 per cent to bring the yearly average up to 1,423,100 bbl. daily. The average domestic demand for the first quarter of this year is forecast at 2,015,000 bbl. daily. This will be the first quarter with distillate demand above 2,000,000 bbl. daily.

Gasoline demand is projected on a basis of an increase in domestic demand of 4.7 per cent over 1952 compared with a gain of 5.8 per cent for 1952 over 1951. Gasoline exports are expected to be down almost 14 per cent to give a net gain in total demand for gasoline of 4.2 per cent.

The estimated average number of motor vehicles in use during 1952 was about 4.5 per cent greater than in 1951. The average for 1953 is expected to be about 4 per cent greater than in 1952. Total motor vehicles in use may exceed 56,000,000 by the end of 1953.

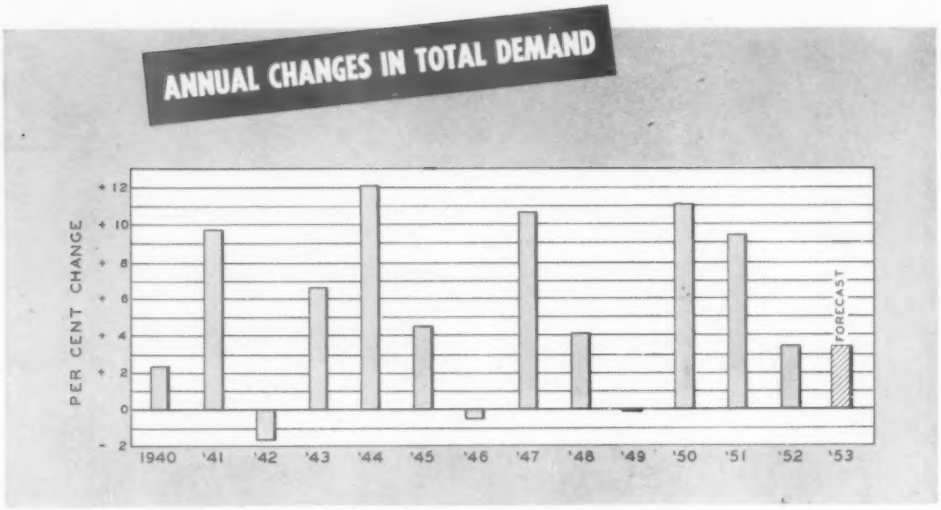
Residual-fuel demand tends to follow the produc-



1953 Supply and Demand By Quarters

(Thousands of barrels daily)

	First quarter		Second quarter		Third quarter		Fourth quarter	
	Volume	Per cent increase over 1952	Volume	Per cent increase over 1952	Volume	Per cent increase over 1952	Volume	Per cent increase over 1952
Domestic demand	**8,166**	**6.1**	**7,104**	**6.0**	**7,141**	**4.6**	**8,186**	**3.3**
Gasoline	2,945	4.7	3,442	4.7	3,507	4.6	3,312	4.8
Kerosine	520	7.3	218	4.8	225	8.6	495	7.1
Distillate	2,015	9.9	1,022	6.2	940	10.4	1,724	7.1
Residual	1,785	3.6	1,411	7.1	1,354	2.7	1,665	—1.2
Lubricants	100	—1.1	106	2.1	110	1.2	100	—1.0
Other products	781	8.1	885	9.8	985	1.5	870	—1.6
Crude loss	20	—11.5	20	38.9	20	25.0	20	....
Exports	**334**	**—17.3**	**350**	**—25.7**	**314**	**—26.8**	**300**	**—23.9**
Gasoline	80	—11.1	85	9.1	75	—24.6	70	—24.0
Kerosine	17	—19.4	15	—43.4	18	—24.4	15	—16.7
Distillate	54	—10.0	58	—45.9	54	—46.2	52	—35.8
Residual	56	—24.6	60	—40.0	50	—31.6	48	—32.4
Lubricants	34	—32.5	38	—17.7	35	—22.7	40	2.6
Other products	26	—0.4	27	—13.7	27	0.4	25	4.0
Crude	67	—18.2	67	—18.1	55	—8.0	50	—25.4
Total demand	**8,500**	**4.9**	**7,454**	**4.0**	**7,455**	**2.8**	**8,486**	**2.0**
Gasoline	3,025	4.2	3,527	4.8	3,582	3.8	3,382	4.0
Kerosine	537	6.2	233	—0.6	243	5.2	510	6.3
Distillate	2,069	9.3	1,080	1.0	994	4.4	1,776	1.3
Residual	1,841	2.4	1,471	3.8	1,404	0.9	1,713	—2.5
Lubricants	134	—11.6	144	—4.0	145	—5.8	140	....
Other products	807	7.7	912	8.9	1,012	1.4	895	1.2
Crude	87	—16.7	87	—9.6	75	—1.1	70	—19.5
Stock change	**—393**	....	**+430**	....	**+352**	....	**—320**	....
Crude	—70	....	+ 10	....	+ 65	....	....	....
Products	—323	....	+420	....	+287	....	—320	....
New supply	**8,107**	**2.8**	**7,884**	**6.5**	**7,807**	**0.5**	**8,166**	**—1.1**
Imports	**1,055**	**11.5**	**945**	**1.8**	**920**	**2.2**	**1,085**	**3.3**
Crude	610	22.9	600	8.1	610	—0.8	645	7.5
Products	445	—1.0	345	—7.7	310	8.6	440	—2.2
Production	**7,052**	**1.7**	**6,939**	**7.1**	**6,887**	**0.4**	**7,081**	**—1.7**
Crude	6,412	1.4	6,319	7.1	6,262	—0.2	6,421	—2.1
Natural gasoline, etc.	640	4.3	620	8.4	625	6.1	660	2.0
Crude run to stills	**6,979**	**4.9**	**6,798**	**12.5**	**6,708**	**—4.5**	**6,970**	**0.1**
Crude transfers	**26**	**—6.5**	**24**	**0.8**	**24**	**3.9**	**26**	**—7.1**



tion-index curve more than other petroleum products. Any reduction in consumption of residual, resulting from decreased activity at manufacturing plants, will come near the end of the year. Domestic demand for the fourth quarter is forecast at a loss of 1.2 per cent over the same quarter in 1952. Very low residual prices could raise the demand since residual is the one petroleum product which can replace other fuels on a short notice if the price differential is great enough.

Export demands for lubricants were 5.5 per cent less in 1952 than in 1951 and are expected to drop another 18 per cent in 1953. Domestic demand for lubricants dropped 10.5 per cent in 1952 to 103,700 bbl. daily. Very little change is expected for 1953.

Total Stocks Up 42 Million Barrels

Total stocks of all oils gained about 42,000,000 bbl. in 1942 following an increase of 37,000,000 bbl. in 1951. Even though many suppliers consider current inventory levels high enough for the end of 1953, a small increase of 18,400 bbl. daily is forecast for this year. Since 115,000 bbl. daily of last year's new supply went into building inventories, the net addition of only 18,400 bbl. daily will tend to hold the percentage increase for total new supply lower than the increase in total demand.

The trend in the last half of 1952 was toward larger imports of crude. If this trend continues, total imports may exceed the average for 1942 by about 4.7 per cent compared with the gain of 3.4 per cent for total demand.

Thus the lack of any need for any inventory build-up in 1953 will reduce the gain in required new supply to 2.1 per cent despite the fact that total demand is expected to increase 3.4 per cent. The trend toward higher imports will cut the projected increase in total domestic production to 1.7 per cent.

Consumer demand for light products and public demand for conservation of these light fuels will add an estimated 5.1 per cent to the production at natural-gasoline and cycling plants.

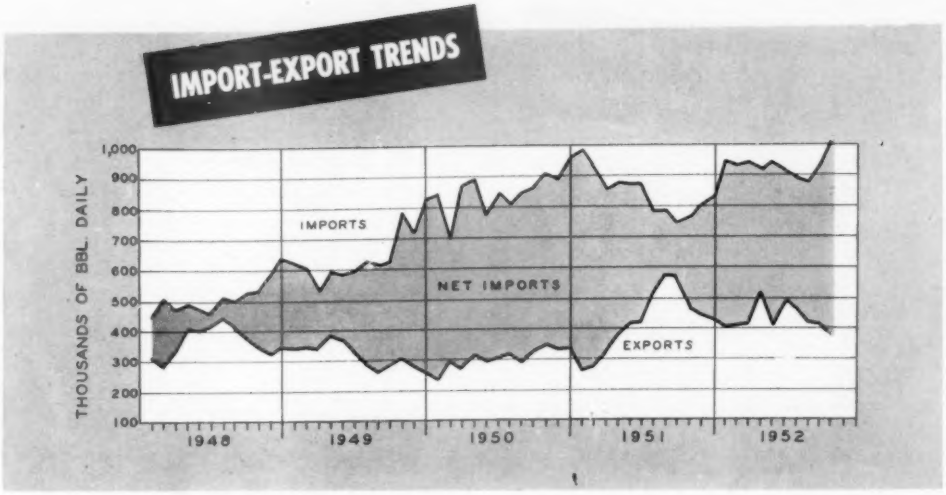
Crude production for the year is forecast at an average of 6,353,300 bbl. daily for a gain of 1.4 per cent compared with a 1.9 per cent increase in 1952.

FREE WORLD SUPPLY AND DEMAND WITH DETAIL FOR UNITED STATES

(Thousands of barrels daily)

	1953 Forecast		*1952	
	Volume	Per cent increase over 1952	Volume	Per cent increase over 1951
Total Free World	**12,550**	**6.2**	**11,825**	**5.8**
Western Hemisphere	9,450	5.3	8,973	5.1
North America	8,508	5.2	8,088	3.9
United States	7,648	5.0	7,287	3.6
U. S. Supply and Demand Detail				
Domestic demand	**7,647.9**	**5.0**	**7,287.0**	**3.6**
Gasoline	3,303.1	4.7	3,153.6	5.8
Kerosine	364.0	6.9	340.4	0.8
Distillate	1,423.1	8.3	1,313.7	7.2
Residual	1,552.9	2.8	1,511.1	—2.2
Lubricants	104.0	0.3	103.7	—10.5
Other products	880.8	4.1	846.3	5.3
Crude loss	20.0	9.9	18.2	—20.9
Exports	**324.4**	**—23.5**	**424.3**	**0.3**
Gasoline	77.4	—13.9	89.9	—18.7
Kerosine	16.3	—26.9	22.3	19.2
Distillate	54.5	—37.4	87.1	40.3
Residual	53.4	—32.9	79.6	
Lubricants	36.8	—18.6	45.2	—5.5
Other products	26.3	—4.7	27.6	6.1
Crude	59.7	—17.8	72.6	—7.4
Total demand	**7,972.3**	**3.4**	**7,711.3**	**3.4**
Gasoline	3,380.5	4.2	3,243.5	4.9
Kerosine	380.3	4.9	362.7	1.8
Distillate	1,477.6	5.5	1,400.8	8.8
Residual	1,606.3	1.0	1,590.7	—2.1
Lubricants	140.8	—5.4	148.9	—9.0
Other products	907.1	3.8	873.9	5.3
Crude	79.7	—12.2	90.8	—10.5
Stock change	**+18.4**	.....	**+115.0**	.....
Crude	+1.6	.....	+45.0	.....
Products	+16.8	.....	+70.0	.....
New supply	**7,990.7**	**2.1**	**7,826.3**	**3.6**
Imports	**1,001.1**	**4.7**	**956.3**	**13.7**
Crude	616.3	8.7	566.8	15.5
Products	384.8	—1.2	389.5	10.5
Production	**6,989.6**	**1.7**	**6,870.0**	**2.3**
Crude	6,353.3	1.4	6,264.6	1.9
Nat. gasoline, etc.	636.3	5.1	605.4	7.5
Crude run to stills	**6,863.3**	**2.9**	**6,669.9**	**2.7**
Crude transfers	**25.0**	**—2.7**	**25.7**	**5.7**

*Partly estimated.



OIL IMPORTS MOUNTING

Gain of 6 Per Cent Seen in Crude Imports

by Dahl M. Duff

IMPORTS of crude oil into the United States are continuing to mount, but percentagewise, the ratio of these imports to the rising level of domestic operations shows only a minor increase.

Through the first three quarters of 1952, the United States was a net importer of crude oil to the extent of 481,000 bbl. daily. For the entire year, it is estimated net crude imports averaged 498,000 bbl. daily. For 1953, net crude imports are forecast at a rate of about 543,000 bbl. daily.

By far the larger part of this net increase is due to further gains in the import total. Crude exports, about three-fourths of which go to Canada, averaged around 72,000 bbl. daily for 1952 and are expected to drop to some 62,000 bbl. daily in 1953.

Crude imports into this country totaled 556,000 bbl. daily during the first three quarters, and for the entire year, approximately 570,000 bbl. daily. This year these imports are expected to rise to a rate of 605,000 bbl. daily, representing a gain of slightly more than 6 per cent.

Whether crude imports will continue indefinitely to make up 10 per cent or less of total United States supply depends on a number of factors such as exploratory success in the United States, the price differential of domestic vs. foreign crude, and of course, the tariff level. One opinion on what the future holds was given in the report of the President's Materials Policy Commission last June. The study predicted net oil imports into the United States in 1975 would be about 2,500,000 bbl. daily, with a domestic production, including that from shale and coal, of 11,200,000 bbl. daily.

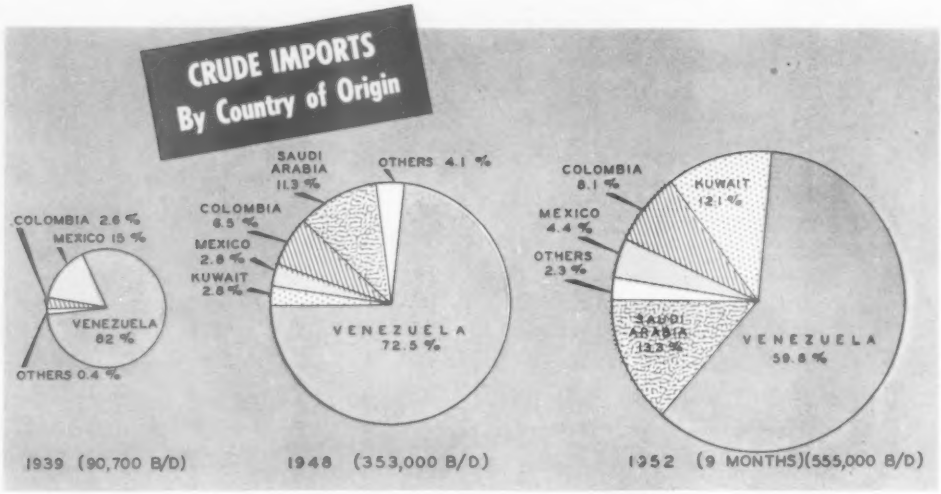
Crude-oil imports on the West Coast, which in past years have been negligible, last year became a sizable factor in the United States total. This traditionally self-contained oil region is using foreign oil in growing volume because local production of lighter crudes has failed to keep pace with the sharply expanded civilian and military requirements.

In the early part of the summer, Saudi Arabian and Venezuelan crude began moving to California refineries in appreciable quantity. West Coast crude imports seem likely to continue in whatever volume is necessary. Canadian and possibly West Texas crude also will supplement California production, probably replacing the Saudi Arabian shipments which are considered uneconomic.

Venezuela continues its dominant position among the suppliers of crude oil imported into the United States, although the Middle East producing countries have taken an increasing part of the market since the end of the war. Mexico, which once was a major sup-

UNITED STATES EXPORTS—IMPORTS
(Thousands of barrels daily)

	Products			Crude			Total crude and products net imports
	Imports	Exports	Net imports	Imports	Exports	Net imports	
1948	161	260	—99	353	108	245	146
1949	225	236	—11	421	91	330	319
1950	363	210	153	487	95	392	545
1951:							
1st 6 mo.	394	262	132	507	87	420	552
2nd 6 mo.	312	426	—114	474	70	404	290
1952:							
1st quarter	450	322	128	496	82	414	542
2nd quarter	374	389	—15	555	82	473	458
3rd quarter	285	369	—84	615	60	555	471
1952 (9 mo.)	369	360	9	556	75	481	490



plier to the United States, now furnishes only a relatively minor share.

Disregarding short-term variations and barring some major upheaval in the industry such as a large-scale stoppage of Venezuelan production, it does not seem likely that these Middle East countries will do much more than retain their general percentage position in the total of crude imports into the United States. Kuwait, for example, sent 74,000 bbl. daily into the United States in 1950. This dropped to 59,000 bbl. daily in 1951, and for the first three quarters of 1952 averaged some 67,000 bbl. daily. Saudi Arabian crude imports were at a rate of about 67,000 bbl. daily the first three quarters compared to 44,000 bbl. daily in 1951 and 40,000 bbl. daily in 1950. This development apparently reflects the curtailment of other dollar markets for Saudi Arabian crude.

Tanker charges are too high to make crude shipments from the Middle East economic, at least for the nonproducer who buys at the posted Persian Gulf price and who lacks his own vessels for the movement. An upward change in the price of crude oil in the United States—for example, the $3 crude which some operators in the United States hope for—would make Middle East crude imports somewhat more attractive since a corresponding change in Persian Gulf prices would not necessarily follow.

Crude imports from Venezuela have gained. For the first three quarters Venezuelan crude imports totaled 332,000 bbl. daily against 294,000 bbl. daily for 1951, 293,000 bbl. daily for 1950, and 273,000 bbl. daily for 1949. Other Western Hemisphere crude came into the United States from Mexico, 24,000 bbl. daily, and Colombia, 45,000 bbl. daily.

About 3,000 bbl. daily of Canadian crude came into the United States during the first three quarters of 1952. In all probability, Canadian crude will find a larger market in the United States in coming years, not only in the Pacific Northwest but also in the Great Lakes region. United States crude exports to Canada will continue to decline as a result of wider utilization of the country's own production and other imports into eastern Canada from the Middle East and the Caribbean.

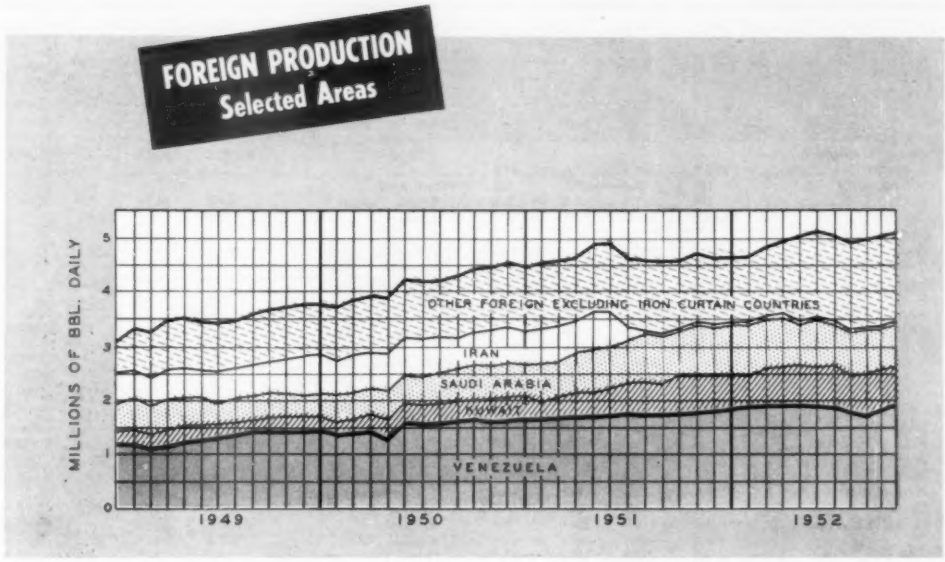
Refined products . . . The United States' position in its imports and exports of refined products differs considerably from that in crude oil. Ninety per cent or more of all products imported into this country consist of residual fuel oil, nearly all of which is brought into markets on the East Coast. These imports have long been defended as an economic necessity because of the competition from coal and natural gas and the resultant low price which discourages heavy-fuel-oil production by domestic refiners.

It is estimated that United States products imports, mostly heavy fuel oil, will average around 360,000 bbl. daily in 1953, a slight drop from the approximately 370,000 bbl. daily of products imported in 1952. In 1951 products imports averaged 353,000 bbl. daily of which all but 29,000 bbl. daily was residual fuel oil, and 360,000 bbl. daily in 1950, of which all but 33,000 bbl. daily was residual fuel oil.

An anticipated decline in United States products exports conforms to a long-term trend. During the current year, products exports are forecast at a rate of about 236,000 bbl. daily compared to about 350,000 bbl. daily in 1952 and 345,000 bbl. daily in 1951.

Prior to the middle of 1951, United States exports of finished products were showing a consistent year-to-year drop. This trend, largely the result of refinery construction abroad coupled with competition from other exporting centers, was completely disrupted in 1951 by the nationalization and subsequent shutdown of the Iranian oil properties. Industry efforts to make up for this loss caused a rise in United States exports from 262,000 bbl. daily the first half of that year to 426,000 bbl. daily the second half. This abrupt change is brought out in an accompanying chart showing total United States exports and imports.

These export purchases, principally by British companies, continued through 1952 but to a diminishing extent. During the last half of the year, the purchases were principally aviation gasoline and distillates. With much new refinery capacity now in operation in Europe, the use of the United States as an emergency source of replacement of Iran's oil has all but ended, and this country's exports of products are expected to resume their former downward trend.



WORLD OUTPUT STABILIZING

Free-World Production 11¼ Million Barrels

by Dahl M. Duff

WORLD production of crude oil over the next few years is expected to settle down to the more moderate rate of increase that developed in 1952.

Last year's output, excluding Russia and its satellites, averaged about 11,220,000 bbl. daily, representing an increase of 4.1 per cent. This compares with the 13 per cent increase in Free World oil production in 1951 and 12 per cent in 1950.

Demand trends indicate that this slackening off in production will continue. Non-Communist world demand in 1953 is expected to rise slightly more than 6 per cent, and even smaller gains are anticipated for 1954 and 1955. However, it is interesting to note that the industry's base has now become so large that even a relatively small percentage increase calls for a major expansion in terms of barrels. A gain of around 6 per cent in Free World production next year will call for the addition of more than 700,000 bbl. daily in new production.

The slowdown in the rate of industry growth is compounded of a number of factors. Industrial and trade activity appears to be leveling off in many countries abroad as well as in the United States, and the abnormal demands resulting from the Korean War have largely been satisfied. In Western Europe—the major consuming area of the Eastern Hemisphere—coal production has been above expectations. In a number of countries, burdensome and excessive taxes still exert a depressing influence on oil consumption.

An increasing amount of unused but available producing capacity appears likely to confront the industry under these circumstances. Producers in the United States are now carrying about a million barrels reserve capacity, and roughly half this amount is available outside the United States, mainly in fields of the major oil exporting countries of Kuwait, Saudi Arabia, and Venezuela. Elsewhere, foreign production is generally at the maximum rate.

As a result of the cessation of operations in Iran, roughly nine-tenths of all oil moving in international trade now comes from four major producing countries—Venezuela, Kuwait, Saudi Arabia, and Iraq. The United States draws the major part of its imports from Venezuela, and the Eastern Hemisphere's oil-importing countries, including Western Europe, lean heavily on the three countries of the Middle East. Efforts to broaden the sources of supply of oil for the non-Communist world are evident in the numerous exploratory programs under way in many areas.

Iraq Shows Largest Increase

In 1952, total Free World oil production rose by approximately 450,000 bbl. daily. On an annual basis, approximately 325,000 bbl. daily was lost in Iran from 1951 to 1952. Had Iran been in full production at about 700,000 bbl. daily during 1952, the other major oil-exporting countries would have shown only minor increases or possibly declines. Largest increase in 1952 production was made in Iraq, up about 205,000 bbl. daily.

United States crude production for 1952 is estimated at 6,265,000 bbl. daily, a gain of 1.9 per cent over 1951. This compares to a 13.8 per cent increase in 1951 and 6.8 per cent in 1950. Except for 1949, when domestic output dropped by about 8.5 per cent, the 1952 increase was the smallest of any year since the end of the war.

Outside the United States, demand is expected to

World Crude-Oil Production

(Thousands of barrels daily)

Country—	1952	1951	Per cent change '52 vs. '51	1950
Western Hemisphere:				
Argentina	68.5	66.0	3.8	64.0
Bolivia	1.5	1.4	7.1	1.6
Brazil	2.0	1.9	5.3	0.8
Canada	165.5	130.4	26.9	78.4
Chile	2.5	1.8	38.9	1.6
Colombia	105.9	105.7	0.2	93.1
Cuba	0.1	0.2	—50.0	0.3
Ecuador	7.7	7.6	1.3	7.4
Mexico	214.0	211.2	1.3	197.6
Peru	44.9	44.1	1.8	41.2
Trinidad	58.0	57.1	1.6	56.0
Venezuela	1,800.0	1,704.6	5.6	1,498.0
Total	2,470.6	2,332.0	5.9	2,040.0
Europe and Africa:				
France	7.0	5.4	29.6	2.4
French Morocco	2.5	1.5	67.0	0.8
Western Germany	33.6	26.5	26.8	21.0
Italy	1.4	0.4	250.0	0.2
Netherlands	13.7	13.6	0.7	13.4
Egypt	44.4	44.6	—0.4	44.5
United Kingdom	1.1	0.9	22.0	0.9
Total	103.7	92.9	11.6	83.2
Middle East:				
Bahrein	30.1	30.1		30.2
Iran	26.0	350.4	—92.6	665.4
Iraq	380.6	176.3	115.9	136.2
Kuwait	750.0	561.4	33.6	355.0
Qatar	68.4	48.8	40.2	34.1
Saudi Arabia	830.0	761.5	9.0	546.7
Turkey	0.4	0.3	33.3	0.3
Total	2,085.5	1,928.8	8.1	1,767.9
Other Asia:				
British Borneo	105.0	102.7	2.2	84.8
Burma	2.3	2.0	15.0	1.0
India	5.6	5.3	5.6	5.0
Indonesia	168.0	151.7	10.8	141.0
Japan	5.9	6.4	—7.8	5.6
New Guinea	4.7	4.8	—2.1	4.8
Pakistan	4.0	3.2	25.0	3.3
Total	295.5	276.1	7.0	245.5
Total foreign less Russia and other Communist areas	4,955.3	4,629.8	7.0	4,136.6
United States	6,265.0	6,149.4	1.9	5,402.3
Total Free World	11,220.3	10,779.2	4.1	9,538.9
Estimated Russia and other Communist areas:				
Austria	47.0	42.0	11.9	34.0
Romania	85.0	85.0		85.0
Russia	935.0	842.0	11.1	754.0
Other Communist areas	25.2	24.9	1.2	25.3
Total	1,092.2	993.9	9.9	898.3
Total foreign	6,047.5	5,623.7	7.5	5,034.9
Total world	12,312.5	11,773.1	4.6	10,437.2

*Includes Albania, Czechoslovakia, Hungary, Poland, and Yugoslavia.

hold up better than in this country, though still considerably below the boom years of 1950 and 1951. The outlook for 1953 calls for an increase in foreign demand on the order of 8 per cent. This compares with an increase of about 9.4 per cent in 1952, 15.4 per cent in 1951, and 16.7 per cent in 1950.

Venezuelan production during 1952 showed the effects of declining demand, particularly for heavy fuel oil on the East Coast of the United States. Venezuelan production was up less than 6 per cent compared to nearly 14 per cent in 1951. Venezuelan officials had hoped that output by the end of the year would reach close to 2,000,000 bbl. daily, but by November the total was back up to only slightly above 1,800,000 bbl. daily, which was the average for the entire year.

A tabulation of crude-oil reserves by countries appeared in the Journal issue of December 22, 1952.

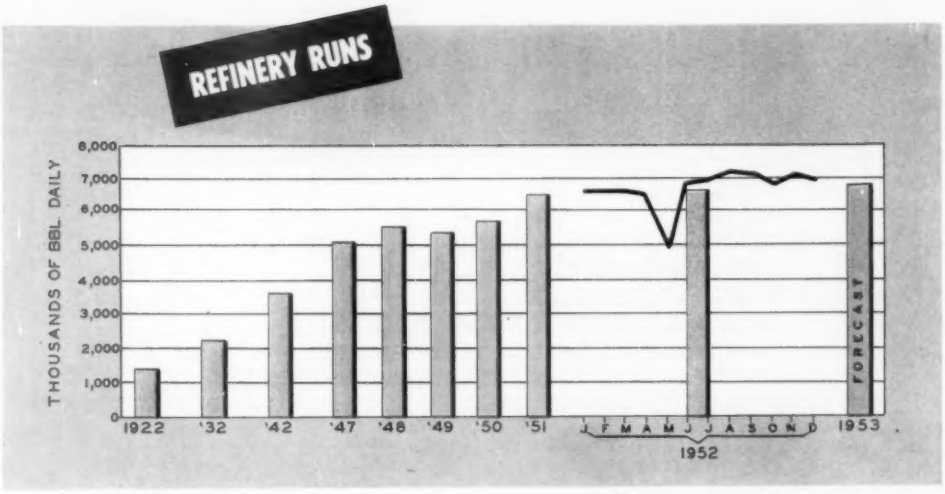
The boom continued in Canadian oil during 1952 but the output of the prairie provinces, mainly Alberta, was held down to the amount consumed locally and what could be moved by the single pipe-line outlet to the head of the Great Lakes. The approximately 27 per cent gain in Canadian crude output during the year reflected these conditions. As a result of the initial completion of the new Trans Mountain line to the Pacific Northwest next fall and greater capacity in the Interprovincial system, Canadian production probably will show a good increase in 1953.

The Middle East's production in 1952 of about 2,085,500 bbl. daily represented a gain of nearly 157,000 bbl. daily, or 8.1 per cent, over the previous year. The percentage increase was the smallest of any of the postwar years.

On the side of operations, the most important development in the Middle East during 1952 was the completion of the 30 and 32-in. pipe line from Kirkuk field in Iraq to a new tanker terminal at Banias on Syria's Mediterranean Coast. The major section of the line from Banias to Station K-3 on the existing system of Iraq Petroleum Co., Ltd., was finished when the tie-in weld was made February 21. Initial tanker shipments began from Banias in mid-April. During the remainder of the year, work continued on additional pumping facilities.

Iraq production climbed steadily following the commencement of initial operations through the new line. Kirkuk field produced 164,000 bbl. daily in January, the limit allowed by the 16 and 12-in. outlets. By March, the field's production had risen to 212,000 bbl. daily, by May to 341,000 bbl. daily, and by September to 421,000 bbl. daily. During 1953, it is expected that this new line to Banias will move an average of about 340,000 bbl. daily.

In November, for the first time, production from Kuwait topped that of Saudi Arabia. During the month, Kuwait produced some 792,000 bbl. daily, about 28,000 bbl. daily above the average in Saudi Arabia during that month. Saudi Arabian production reached an all-time high of 899,000 bbl. daily in June but fell back the remaining months of the year. Kuwait's peak came in July when the single field in that shaikhdom, Burgan, averaged slightly over 810,000 bbl. daily.



RECORD DESPITE STRIKE

Refinery Output Hits New Peak in 1952

REFINERS in the United States set another all-time record in 1952 with runs averaging 6,668,000 bbl. daily for an increase of 176,000 bbl. daily or 2.7 per cent over 1951. This record was established despite a refinery strike in May that closed down more than a third of the total refining capacity for most of the month.

The largest increase in volume throughput for the year was in the Texas Gulf Coast refining district where the average for 1952 was 33,000 bbl. daily greater than in 1951. Runs in California were up 31,000 bbl. daily. The largest relative gain was reported for Texas Inland district, up 5.3 per cent.

Refinery runs in 1952 were almost four times as great as in 1922. The historical comparison, shown in the accompanying table, indicates that the greatest relative gain in the past 30 years was in the Illinois-Indiana-Michigan district where the increase was 881 per cent. Runs at refineries in Texas Gulf Coast district gained 648 per cent in the same period.

The trend toward higher distillate yields that has been very pronounced since the end of the war was continued in 1952. Also, there was a further reduction in the average yield of residual from a barrel of crude. The average distillate yield for 1952 was about 21.4 per cent, the highest on record. Residual fuel was down to 18.5 per cent compared with the previous low of 19.7 per cent established in 1951.

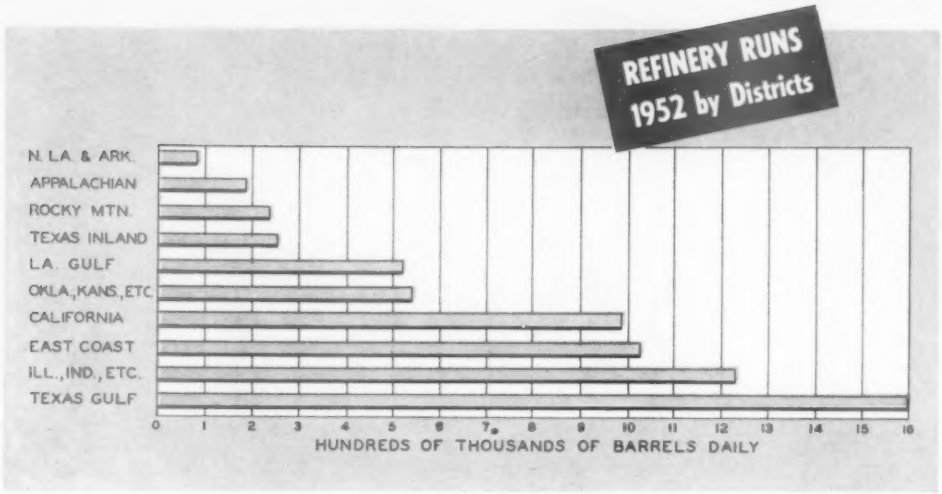
Reported kerosine production from a barrel of crude was off slightly to 5.4 per cent from 5.7 per cent a year earlier. Kerosine yields averaged 6.0 per cent for 3 years just after the end of the war. The lower yield in 1952 may have been influenced by the lack of strength in fuel markets. In some areas more of the light fuel is marketed as No. 1 fuel when the product is hard to move. No. 1 fuel is reported by refiners as distillate production. Kerosine yields were down in 1949, the first year of soft markets following the war.

The highest average yield of gasoline for the year was in the Oklahoma-Kansas-Missouri refining district. The yield in this district was 51.3 per cent compared with 48.4 per cent in 1951. The average yield for this district in the 3-year period from 1946 through 1948 was slightly less than 47 per cent.

The gain in gasoline yield in the Mid-Continent has been due, basically, to the installation of additional processing equipment at refineries in the district. The utilization of this equipment to the fullest extent in

REFINERY RUNS BY DISTRICTS
(Thousands of barrels daily)

	1922	1932	1942	1947	1948	1949	1950	1951	1952	Per cent increase 1952 over 1951	Per cent increase 1952 over 1922
East Coast	276	444	441	815	867	768	908	1,015	1,029	1.4	272.8
Appalachian	57	93	157	166	157	155	165	179	183	2.2	221.1
Illinois, Indiana, etc.	125	292	724	826	908	915	1,039	1,201	1,226	2.1	880.8
Oklahoma, Kansas, etc.	194	238	354	419	452	425	486	520	544	4.6	180.4
Texas Inland	62	135	187	232	246	217	209	245	258	5.3	316.1
Texas Gulf	214	402	840	1,197	1,392	1,283	1,312	1,567	1,600	2.1	647.7
Louisiana Gulf	74	98	147	383	435	432	470	502	522	4.0	605.4
N. Louisiana and Arkansas	21	50	79	68	81	75	71	79	80	1.3	281.0
Rocky Mountain	67	38	95	143	164	177	199	230	241	4.8	259.7
California	282	450	631	826	847	879	880	956	987	3.2	250.0
Total United States	1,372	2,240	3,655	5,075	5,549	5,326	5,739	6,494	6,670	2.7	386.1



1952 probably was due to the need for highest possible yield of the most valuable product in order to maintain refinery realization during a period when fuel markets have tended to be sluggish.

Because of the type of crude processed, California again had the lowest yield of gasoline and the highest yield of residual fuel.

Refineries on the Gulf Coast had the greatest yield of distillates. Texas Gulf Coast had an average of 25.3 per cent and Louisiana Gulf was only slightly less with 25.2 per cent. Louisiana Gulf also had the highest yield of kerosine, 10.6 per cent.

REFINERY YIELD TRENDS

	Runs (thou. bbl. daily)	Yields (per cent) Gasoline	Kerosine	Distillate	Residual
1935	2,646	44.2	5.8	10.4	26.9
1936	2,920	44.1	5.3	11.8	27.0
1937	3,242	43.9	5.5	12.4	26.4
1938	3,192	44.3	5.5	13.0	25.3
1939	3,191	45.0	5.5	13.1	24.7
1940	3,536	43.1	5.7	14.2	24.4
1941	3,861	44.2	5.2	13.4	24.3
1942	3,655	39.8	5.1	14.7	26.9
1943	3,917	37.1	5.0	14.8	29.2
1944	4,551	39.4	4.7	14.4	27.7
1945	4,711	40.9	4.7	14.5	27.3
1946	4,740	39.6	6.0	16.6	24.9
1947	5,075	40.2	6.0	16.8	24.2
1948	5,549	40.3	6.0	18.7	22.9
1949	5,327	43.7	5.2	17.4	21.7
1950	5,739	43.0	5.6	19.0	20.2
1951	6,494	42.4	5.7	20.0	19.7
1952	6,668	43.0	5.4	21.4	18.5

REFINERY YIELDS BY DISTRICTS—1952
(Per cent)

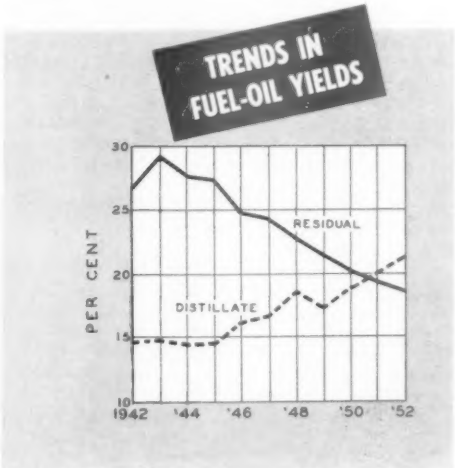
	Gasoline	Kerosine	Distillate	Residual
East Coast	37.9	4.2	23.3	22.0
Appalachian 1	43.0	5.3	15.7	12.5
Appalachian 2	48.6	5.5	16.0	17.8
Illinois, Indiana, etc.	50.3	6.2	18.4	13.5
Oklahoma, Kansas, etc.	51.3	2.7	23.4	10.6
Texas Inland	51.1	4.8	15.8	14.9
Texas Gulf	40.9	8.2	25.3	15.9
Louisiana Gulf	43.4	10.6	25.2	10.7
N. La.-Arkansas	34.2	7.9	23.0	7.8
New Mexico	53.7	3.1	15.7	22.3
Other Rocky Mtn.	45.2	2.8	19.7	19.3
California	35.5	0.6	16.4	36.0
Total	43.0	5.4	21.4	18.5

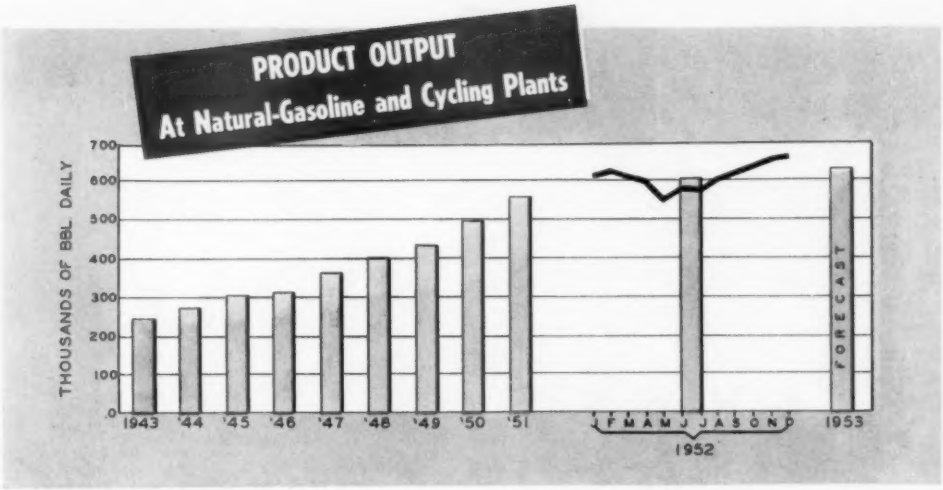
The general seasonal pattern of refinery operations in 1952 was abnormal because of the refinery strike. Runs averaged 6,650,000 bbl. daily in the first quarter which was a little higher than was needed to meet demands. Product stocks at the end of the period were 15,800,000 bbl. greater than on the corresponding date a year earlier.

The between-the-season drop in runs in April probably would have been more severe except for the threatened refinery strike. The actual strike came in May, cutting runs in that month to 4,905,000 bbl. daily.

Runs in the third and fourth quarters were set very high in order to replenish inventories depleted during the strike. The average for the third quarter was 7,021,000 bbl. daily. Product stocks increased rapidly and at the end of the year were about 21,000,000 bbl. greater than at the end of 1951.

Since stock increases in 1953 do not need to be as great as actual in 1952, refinery runs in 1953 will not increase as much as the gain in total demand.





ANOTHER ALL-TIME RECORD

Natural-Gas Liquids Gain of 5 Per Cent Seen

by John C. Casper

ANOTHER all-time record in the production of natural-gas liquids was set in 1952, but the percentage gain for the year was smaller than for the past 2 years.

Production at natural-gasoline and cycling plants averaged 604,700 bbl. daily for a gain of 41,700 bbl. daily or 7.4 per cent over 1951. The percentage gain was about equal to the increase in 1949 but fell below the large gains of 15.8 per cent and 12.9 per cent reported for 1950 and 1951 respectively.

Total plant production is expected to move up about 5.2 per cent in 1953 for a yearly average of 636,000 bbl. daily.

The very rapid gains in production and consumption of natural-gas liquids since the end of the war resulted from twin forces, consumer demand for natural gas and natural-gas liquids, and pressure from the public for greater conservation of these natural resources. Increases in consumption of gas and light products seem to have dropped back more in line with the increases for petroleum products from crude.

The program for expanding capacity of natural-gas pipe lines will be continued, but the expansion rate may be less than in the years just after the end of the war because of the increasing scarcity of large blocks of undedicated gas reserves.

The smaller percentage increases also reflect the larger base figures on which the gains are calculated. The volumetric gain in 1952 was about the same as the gain in 1943 when it represented an increase of 13.7 per cent over the relatively small base in 1942.

Natural-gasoline production averaged about 240,000 bbl. daily in 1952 and is expected to increase to 251,000 bbl. daily for 1953.

Part of the seasonal pattern for consumption of natural gasoline in 1952 was changed by the refinery strike. The market for natural weakens in the early months of the year when refiners start making an intermediate grade of gasoline that contains less natural. Demand climbs sharply in the early fall months when refiners shift back to winter grades.

The refinery strike came in May or just at the beginning of the big gasoline-demand season. With more than a third of the refining capacity closed by the strike, gasoline stocks dropped as much in May as they normally would have for the entire summer. The near shortage of motor fuel promoted the use of natural for blending. Many suppliers were blending maximum amounts of natural up to the limit set by permissible vapor pressures for summer grades.

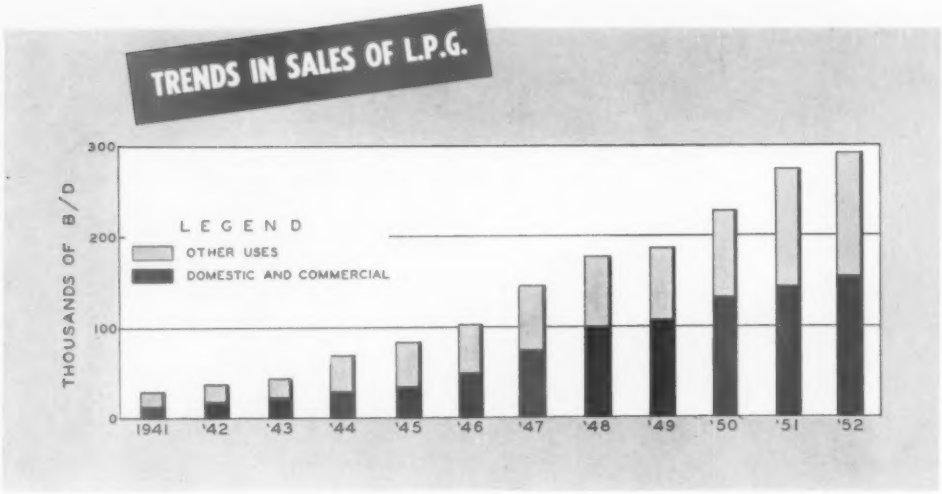
Refinery-produced gasoline in May was 10.4 per cent natural compared with 8.8 per cent in January and 9.0 per cent in December 1951 when refiners were making winter-grade motor fuel.

Since the summer's normal motor-fuel stock reduction came in May, refiners had to meet demands for the remainder of the gasoline season out of current

TOTAL PLANT PRODUCTION BY YEARS
(Thousands of barrels daily)

	1947	1948	1949	1950	1951	*1952
Appalachian	10.5	11.1	11.3	13.6	17.5	15.3
Ill., Ky., Mich.	14.8	14.1	13.5	13.6	13.9	20.2
Kansas	6.5	7.0	7.3	10.1	11.5	12.1
Oklahoma	29.1	30.5	34.2	40.4	47.1	52.4
Arkansas	6.1	6.2	6.2	6.4	6.5	7.1
Louisiana	41.0	46.2	52.8	56.9	61.3	62.5
Mississippi	1.3	3.1	3.5	3.6	3.2	3.3
New Mexico	7.4	8.5	11.0	13.7	15.7	18.1
Texas	172.2	197.0	211.0	256.6	297.6	324.1
Rocky Mountain	3.8	4.6	5.2	6.0	7.7	8.6
California	69.4	72.6	74.4	77.6	81.0	81.0
Total	362.1	400.9	430.4	498.5	563.0	604.7

*Ten months actual, 2 months estimated.



production. These high rates of gasoline production at refineries called for large quantities of natural even for summer-grade fuel.

Grade 26-70 natural on the Group 3 market dropped 1.375 cents a gallon during the last week in February and the first week in March to 5.5 cents. Summer demand boosted the price by 0.25 cent a gallon on July 29, and three other raises between August 22 and September 3 brought the Group 3 price back to the ceiling of 6.875 cents.

Production of L.P.G. at plants increased more than natural gasoline but the percentage gain was smaller than for the past 2 years. L.P.G. output at plants averaged 239,900 bbl. daily for an increase of 12.7 per cent over 1951. The gain in 1951 was 22.4 per cent.

Some of this plant-produced L.P.G. was shipped to refineries for blending into motor fuel. On the other hand, some liquefied refinery gas was marketed as L.P.G.

It is estimated that total consumption of L.P.G. in this country in 1952, other than that used at refineries, totaled about 107,100,000 bbl. or 292,600 bbl. daily. This included L.P.G. processed for the manufacture of synthetic rubber as well as domestic, chemical, industrial, gas manufacture, motor fuel, and other small miscellaneous uses.

Consumption under these classifications represented a gain of about 6.4 per cent over 1951 compared with increases of 21 per cent and 23 per cent in 1951 and 1950. The very small gain in industrial use and the decrease in use for gas manufacture contributed to the smaller relative increase in 1952, but the most important factor was the smaller gain in sales for domestic and commercial use. Consumption under this classification is estimated at 151,000 bbl. daily or 7.1 per cent greater than in 1951. The gain in 1951 is not comparable since a new description of the classification, used for the first time that year, removed a large volume of motor fuel that had been under domestic. The gains for 1948 and 1950 were 28.1 per cent and 24.3 per cent respectively.

The weather in the winter months of 1952 was an important factor in the small increase in domestic use. For most areas of the country, average temperatures were above normal in the first and fourth quarters.

Sales of L.P.G. as motor fuel for internal-combustion engines during 1952 averaged about 23,000 bbl. daily for an increase of almost 25 per cent. Use as motor fuel accounted for about 7.8 per cent of total L.P.G. sales.

PRODUCT OUTPUT AT NATURAL-GASOLINE AND CYCLING PLANTS—1952*
(Thousands of barrels daily)

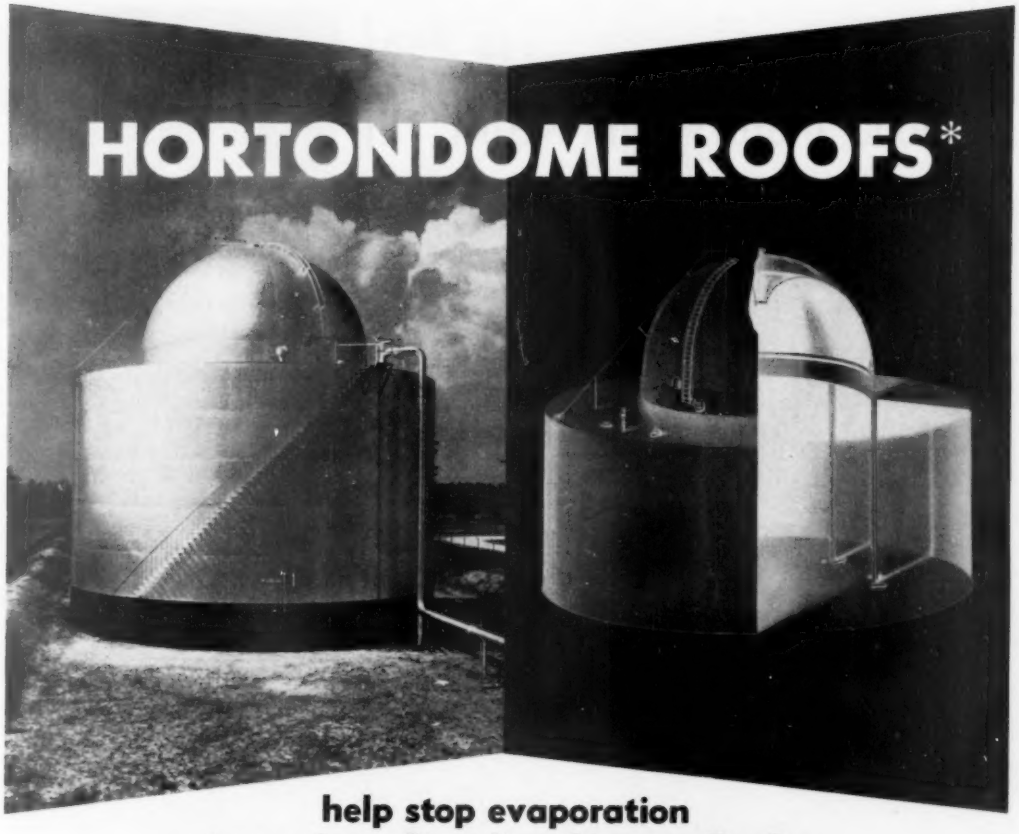
	Natural gasoline	L.P.G.	Other	Total	Per cent increase
Appalachian	3.3	11.9	0.1	15.3	—12.5
Ill., Ky., Mich.	4.2	16.0		20.2	45.3
Kansas	7.1	5.0		12.1	5.2
Oklahoma	26.0	25.2	1.2	52.4	11.0
Arkansas	3.7	3.1	0.3	7.1	9.2
Louisiana	13.4	19.1	30.0	62.5	2.0
Gulf	10.4	6.9	8.4	25.7	7.1
Inland	3.0	12.2	21.6	36.8	—1.3
Mississippi	1.7	1.3	0.3	3.3	3.1
New Mexico	10.3	7.8		18.1	15.3
Texas	114.5	155.3	54.3	324.1	8.9
Texas Gulf	21.2	29.1	23.9	74.2	13.3
West Texas	37.2	35.8		73.0	21.1
East Texas	16.5	16.5	0.2	33.2	2.2
Panhandle	10.4	39.6	0.8	50.8	3.3
Other Texas	29.2	34.3	29.4	92.9	3.0
Rocky Mountain	4.3	4.0	0.3	8.6	11.7
California	51.4	24.6	5.0	81.0	
Total	239.9	273.3	91.5	604.7	7.4

*Ten months actual, 2 months estimated.

PRODUCT OUTPUT BY YEARS
(Thousands of barrels daily)

	Natural gasoline	L.P.G.	Other	Total	Per cent increase
1941	144.1	46.1	31.3	221.5	
1942	135.1	50.5	42.7	228.3	3.0
1943	138.0	59.4	42.9	240.3	5.3
1944	142.4	76.1	54.8	273.3	13.7
1945	163.0	92.2	51.7	306.9	12.3
1946	175.5	91.9	49.7	317.1	3.3
1947	179.0	123.4	59.7	362.1	14.2
1948	193.8	143.7	63.4	400.9	10.7
1949	196.3	158.5	75.6	430.4	7.4
1950	210.6	198.0	89.9	498.5	15.8
1951	235.0	242.4	85.6	563.0	12.9
1952*	239.9	273.3	91.5	604.7	7.4
1953†	251.0	291.5	93.5	636.0	5.2

*Ten months actual, 2 months estimated. †Forecast.



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Houston, 2 ..... 2119 C & I Life Bldg.
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Industry Leaders Look at . . .

WHAT'S AHEAD

On this and the ensuing 10 pages, leaders of the petroleum industry, representing all divisions of operations, present exclusive reviews and forecasts.

BRUCE K. BROWN
President, Pan-Am Southern Corp.

Oil's Troubles With Government Stem From Agencies—Not Congress

by Bruce K. Brown

ON several occasions recently this type of question has been put to me: "Now that the Republicans are going back into power, things will be a lot better for oil, won't they?" Each time it seemed evident that the inquirer thought and hoped that this would be the case and was merely seeking confirmation from me.

Because Mr. Eisenhower expressed himself for states' sovereignty—particularly of the tidelands—and because it is evident that he is surrounding himself with believers in the free-enterprise system, accusations are being leveled at his administration even before it gets into power, to the effect that it will improperly favor petroleum. A nationally known columnist has already spread that charge.

Oil has had some difficulties with the now-expiring administration, but those difficulties have **not** been with Congress. They have been with some of the agencies of the executive branch of government. My own opinion is that congressmen as a group and regardless of their politics have been treating oil fairly. Indeed, the fact that most of the oil is produced in normally Democratic states resulted in a situation in which most of the congressional leaders of the last administration were well informed on oil and relatively sympathetic with its problems. A Republican-dominated Congress will not be any particular help to oil but, on the other hand, I do not think it will be any hindrance. Oil generally neither needs nor asks anything except fairness on the part of any branch of government.

The petroleum business has, in my opinion, been a particular target for self-styled "liberals" in some of the bureaus of the executive branch and the commissions created by Congress. Oil has been a prime target for the antitrust division of the Department of Justice and the Federal Trade Commission. Again, all that oil asks is fairness, but I don't think it got it in these sectors under the Truman administration. I hope it will get it under Eisenhower.

Further Rapid Growth in Canada's Oil Operations Is Assured

by G. L. Stewart

BY the end of 1952, the crude-oil production potential for Canada had reached an estimated 300,000 bbl. a day. Actual production was about 169,000 bbl. a day, about 37 per cent of the national requirement for petroleum. Crude from western Canadian fields was being used by refineries in 5 of the 10 Canadian provinces.

Strenuous efforts were being made by the industry both to expand the production potential and to utilize a greater share of it. During 1952, exploration and development effort in western Canada set new records. Some 300 million dollars were spent; 200 million acres were under lease or reservation; 185 geophysical parties were in the field; 250 drilling rigs were at work; about 1,175 wells were completed as producers. At the end of the year reserves stood at 1,700 million barrels.

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G. L. STEWART
President, Imperial Oil, Ltd.

WHAT'S AHEAD?

To meet a larger part of Canada's demand, both manufacturing and transportation facilities were enlarged during the year. Refinery construction or expansion took place at Vancouver, Edmonton, Regina, Moose Jaw, Fort William, Sarnia, and other places. Work began on a 711-mile crude-oil pipe line from Edmonton to Vancouver, with a branch into Washington. This system will have an initial capacity of 120,000 bbl. a day when it is completed in August 1953. Plans were announced for a 625-mile extension of the Interprovincial pipe line from Superior, Wis., to Sarnia, Ont., with an initial delivery capacity at Sarnia of 85,000 bbl. a day. This expansion of pipe-line deliveries will make it possible to increase production rates in western Canadian fields, and will provide fresh encouragement to the western oil search.

To facilitate the movement of oil products in southern Ontario, products pipe lines went on stream in 1952 between Sarnia, London, Hamilton, and Toronto, and between Montreal, Ottawa, Toronto, and Hamilton. These gave Canada nearly 2,500 miles of trunk oil lines as compared with about 100 miles 5 years ago.

Canada's oil industry has spent a billion dollars since 1946 on the production, transportation, and marketing of petroleum, and plans to spend on at least an equal scale during 1953.

Greater Depths and High Taxes Are Factors in Future Drilling

by Weldon Brigance

THE drilling industry has done an excellent job in effecting economies and efficiencies and in so doing has been able to drill for its customers in many instances at a lower price than prevailed a short time ago. The economies and increased efficiencies have been effected by extensive educational programs within the industry and with improved equipment and drilling techniques, such as the now proven jet rock bit which is proving most effective in materially increasing penetration rates in many areas.

In 1952 the petroleum industry will exceed any previous year in wells and footage drilled. The contractors drilled 90 per cent or more of these wells and this footage. While the future seems bright for the drilling industry, there are a number of factors affecting this future activity which must be considered. Some of these are:

Regardless of the number of wells estimated as required, first there have to be suitable locations to drill and such locations are becoming more difficult to locate. Next, the money must be available for this development and a good many of the major segments of the petroleum industry are already substantially in the money markets as their statements will reflect. As the structures developed are produced from deeper horizons, the discovery costs will materially increase. As these deeper horizons are developed, the drilling industry will be faced with furnishing plant equipment, costing in excess of a half million dollars, and with having to maintain a larger working capital.

These with other factors will increase the development cost. With high taxes and with producing reservoirs no better than those found at the lesser depths, the companies will be forced to drill on a much wider spacing in order economically to continue development. Any prudent management will not continue to recommend to its board that money be borrowed with which to develop properties that will not offer a fair return. This will affect most definitely the number of wells which will be drilled and this should be recognized by the public, by the oil industry, and by the drilling contractors.

F. W. BRIGANCE
Executive vice president, Rowan Drilling Co., Inc. President, American Association of Oilwell Drilling Contractors

Widespread Geophysical Work in Williston Basin Points to More Discoveries

by Dr. B. B. Weatherby

SEISMIC and gravity crews within the United States Williston basin pounded out better than 1,000 crew-months of work in 1952 as compared with 300 the previous year and 150 in 1950. Of these totals better than 90 per cent was seismic work. Since the national increase in activity in each of the last 2 years was about 25 per cent it is obvious that this new province received far more than its share of such increase. This large amount of exploration is certain to result in substantial additional discoveries within the next few years.

There was likewise a noticeable tendency toward enlarged activity in a number of the hitherto neglected geological provinces such as Florida, even though the older well-established areas still received their share of attention.

The seismograph was used to a considerably greater extent in such areas as the Edwards plateau and the Delaware basin where results, to a great extent,

B. B. WEATHERBY
Vice president, Amerada Petroleum Corp.

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previously have been unacceptable. The necessary improvement in quality was attained by distributing the dynamite charge in a series of shot holes arranged in various geometrical patterns rather than having it in one shot hole. A further improvement in quality resulted from distributing a large number of detectors over an appreciable area, instead of along a line as in the past. Utilization of both techniques, although cumbersome and expensive, opens up very attractive areas close to production for further exploration.

On the basis of the nearly uninterrupted annual increase in the use of geophysics for the past 14 years, there seems to be little doubt that barring some unfavorable economic development there will be still further increases in exploratory activity in the future. Since no new method has demonstrated its ability to contribute substantially to the discovery of new oil reserves, reliance must be placed on better utilization of existing methods.

P. C. SPENCER
President, Sinclair Oil Corp.

Oil Has Major Stake in Good Roads

by P. C. Spencer

ONE of the national problems to which the oil industry should, I feel, devote increased thinking in 1953 and the years to come is that of our outdated, overcrowded highway system.

There is no question but that America's network of primary highways and urban streets is rapidly approaching what some have forecast as the "last great traffic jam" in which, bumper to bumper, the nation's stream of motor vehicles will congeal in its ancient traffic arteries.

There is likewise no question that the highway market—the millions of passenger cars, trucks, and buses on the road today—is the oil industry's number one customer. Gasoline has been and, as far as we care to predict, probably will continue to be our first money crop. Nothing can hurt that market more than a road system on which the motoring public cannot or does not care to drive.

Much thought and effort are being devoted to planning how America can revitalize its road system into a safe and adequate one and further still how such revitalization is to be paid for. Unfortunately, the solution is more easily found for the first problem than for the second.

Thus far, the most work on the highway problem has been done by the highway-user groups, and recently a large automobile-manufacturing organization—General Motors—announced a Better Highways Awards Contest which offers prizes for outstanding thoughts on the subject. Tire manufacturers also have been active in discussing the problem.

The PAR movement—Project-Adequate Roads—has begun to work on the problem. Here the highway users showed the way, with a few oil men lending their support. There has been little general consideration given by the oil industry to a matter which is important to every oil company in the country.

Oil men, individually and collectively, if only for their own self-interest, should become interested in and take part in the work being done to get America out of its traffic muddle. As the agency which collects and handles a sizable portion of the tax moneys used to pay for the nation's highways, the oil industry should not let decisions which affect it so vitally be developed without its voice being heard.

Much can be done by the oil industry on the national and state levels to assist in planning for America's better highways of the future. The industry cannot afford to stand disinterestedly in its service station while others figure out how to fix the only road that runs by its pumps.

Unreasoning Type of Nationalism Presents Difficult Problems in Foreign Operations

by Eugene Holman

THE continued presence of an unreasoning type of nationalism in many countries presents one of the most difficult problems facing the United States petroleum industry in its operations outside the United States. This is a kind of exaggerated national feeling in which emotion has often supplanted logical self-interest. It lay behind the tragic succession of events in Iran, and in some other countries, having undeveloped resources, has discouraged investments which we are confident would have been to their advantage.

No one objects to the ideal of true nationalism. Constructive nationalism is entirely consistent with the promotion of a free interchange of goods, ideas, and capital among the countries of the world. Some countries where United States investments have been welcomed are important examples of the benefits arising out of mutually respected arrangements between foreign capital and the country of operations. Good things can flow from a demonstration of these benefits elsewhere. The United States, on its part, can show good faith by rejecting the narrow nationalism which finds expression in demands for excessive tariff protection and unwarranted reduction of our imports from abroad.

EUGENE HOLMAN
President, Standard Oil Co. (N. J.)

The industry faces other problems of

a more specialized nature as it moves into 1953. Abroad, many countries still find it difficult to earn the foreign currency they require. A considerable flexibility in financial arrangements is necessary to provide these areas with the oil they must have.

If operations in Iran are to resume, then short-term conditions of oversupply may result. However, this seems much less important than the need for adhering to sound principles, including that of prompt, adequate, and effective compensation, in any settlement of the Iranian dispute.

In the United States, the rapidly rising demand for heating oil has made more pronounced the spread between summer and winter operations. This calls for continued efforts to expand storage capacity to accommodate the heavy fluctuations in inventory. The industry's over-all domestic supply position is strong, and the broad expansion programs which have been carried out or are under way in producing, refining, transportation, and distribution promise a comfortable margin of capacity to meet the anticipated increase of about 5 per cent in total volume of demand in 1953.

The industry has every reason to be proud of its achievements during 1952. Present indications point to another satisfactory year in 1953 with the boom growth conditions of the 1950-51 period tapered down to a normal expansion.

RAWLEIGH WARNER
Chairman of the board, Pure Oil Co.

Excessive Taxation and Regulation Discourage Needed Investments

by B. Brewster Jennings

CONTINUED expansion of the oil industry obviously will require great amounts of capital. Full understanding of this need, particularly by governments, is essential if the job which lies ahead is to be done. This applies, I believe, not only to national governments here and abroad, but also to state and local governments.

Excessive taxation and regulation discourage investment, whether imposed by a national government or by smaller units. State and local governments sometimes are tempted to impose burdens which they reason are small when considered against the size of the whole industry. These burdens, however, may be very great in the aggregate.

B. BREWSTER JENNINGS
President, Socony-Vacuum Oil Co., Inc.

This is not to minimize the importance of the many other factors contributing to capital availability, but rather to stress that the problem is many sided and that some of the solutions rest outside the industry itself.

Cost of Money for Needed Expansion May Decline by End of Year

by Rawleigh Warner

THIS comment is limited to the question of future interest rates. Assuming no new and violent strains on the economy, I believe the cost of money will decline by the end of the year.

This conclusion is based on both facts and hopes. One hope is that the "excess profits" tax will expire on schedule—June 30. If so, it will leave more earnings in business treasuries and thus lessen the demand for outside money. This tax has induced a considerable amount of corporate borrowing for the sole purpose of creating interest-payment credits against taxable income. Thus such debt will undoubtedly terminate with the termination of the tax. Other possible tax reductions would increase the take-home pay of individuals.

With every assurance of a continuation of the autonomy of the Federal Reserve Board that was restored last year, the prospect of further monetization of the federal debt would seem to be greatly lessened. Thus it seems a reasonable assumption that the Treasury, under the new administration, will attempt to refund a sizable portion of the present short-term Government debt through the sale of long-term bonds to individuals, insurance companies, and other private institutions. To the extent that government securities are thereby lifted from the banks, the Treasury would become less competitive with business in the use of bank credit.

It seems probable that industrial expansion in most lines as well as home building will proceed at a slower pace and at a more stable price level. Inventories built up in anticipation of these demands and rapidly rising prices since Korea will probably be reduced, with consequent reduction of bank loans. The likelihood of diminishing "wage inflation" should also contribute to easier money.

We are justly concerned with record-breaking debt in nearly all categories except farm mortgages. But debt must always be viewed in terms of capacity to pay. As a percentage of national income, total debt is not out of line. It is, in fact, lower than at any time in 20 years except for a short time in 1943.

Paralleling the rise in debt is the large increase in the savings of the people. As one example, new life-insurance purchases are at an all-time peak, increasing company assets by 4.9 billion dollars in 1952. Reports indicate that comparable records of saving are being made by all other thrift institutions, as well as by government and industrial pension funds.

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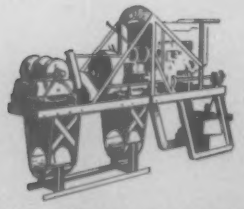

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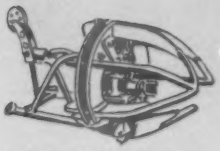

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Continued Expansion in Petrochemicals Output Is Assured

by T. M. Martin

T. M. MARTIN
President, Lion Oil Co., El Dorado, Ark.

AMERICAN industry's confidence in the future of chemicals is exemplified by the fact that nearly a billion dollars a year is being spent for expansion. About one-fourth of all the chemicals made in this country are petrochemicals, and in the next decade it is estimated that the proportion will approach 50 per cent.

Ten years ago our company was almost exclusively an integrated petroleum operation. In those 10 years the manufacture of synthetic nitrogen through petrochemistry has completely altered the nature of this one company's activities. Even though we are an oil company in name, upon completion of facilities now under construction we will be as much a chemical company as we are an oil company.

The demand for synthetically produced nitrogen materials should continue upward as the population grows. With the United States population increasing from 92 million 40 years ago to an estimated 190 million in 1975, and with a corresponding drop in the proportion of the farm population from 35 per cent of the whole to an estimated 10 per cent, it follows that agricultural chemicals will assume greater significance as each year fewer farmers raise more crops. Farmers will need more fertilizers to realize greater crop yields, for as the population increases, arable acres of land remain the same.

Of the three essential plant nutrients, nitrogen, phosphorus, and potash, nitrogen is in shortest supply. It is being synthetically produced at an ever-increasing rate by using natural gas, air, and water to manufacture ammonia, the basic ingredient of nitrogenous fertilizer materials.

Ammonia can also be employed as a raw material for the production of many industrial items such as plastics and synthetic fibers. Although it does not appear likely that producers of agricultural chemicals will be facing the problem of supply out-distancing demand in the near future, it is encouraging to know that combined agricultural and industrial demand for ammonia and its derived chemical products should provide an ample market for the makers of petrochemicals.

Canadian Refinery Task Is to Keep Pace With Phenomenal Demand Gains

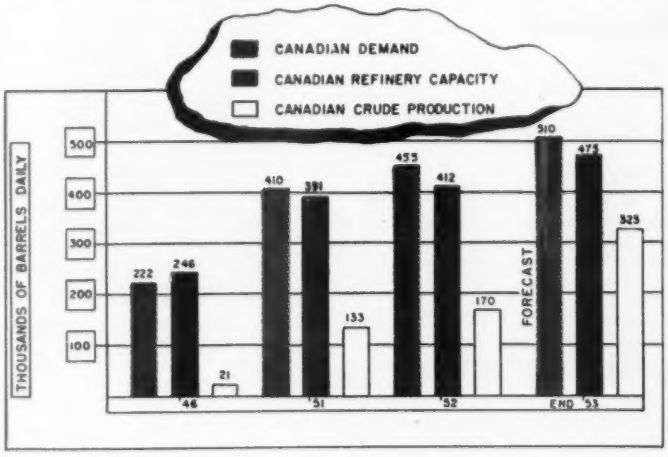
by M. S. Beringer

M. S. BERINGER
Chairman of board, British American Oil Co., Ltd.

CANADIAN postwar demand for petroleum products has increased at a phenomenal rate, from 222,000 bbl. daily in 1946 to 455,000 bbl. daily in 1952, or 105 per cent. All indications point to a demand of over 500,000 bbl. daily in 1953. Although refiners have expended approximately $150,000,000 on refinery expansion during this 5-year period, refinery capacity continues to lag behind demand as shown by the following figures:

	1946	1951	1952	*1953
Rated refinery capacity as a per cent of demand	111	95	91	93

*Estimated.



Basically, this lag between refining capacity and demand can be attributed to insufficient pipe-line transportation facilities from the major oil-producing area of Alberta to the Ontario and the

Pacific Coast markets. This is best illustrated by the fact that Canadian allowable crude-oil production in 1952 (based on demand) was only 170,000 bbl. daily, although potential production was between 285,000 and 300,000 bbl. daily.

New construction now under way will increase over-all crude oil refining capacity 15 per cent, from 412,000 bbl. daily to an estimated 475,000 bbl. daily in 1953. Most of this increased capacity will be built in Ontario and British Columbia, with some small expansion in Saskatchewan. At the same time, catalytic cracking capacity to produce higher-octane gasoline will be increased approximately 26 per cent.

The Trans Mountain Pipe Line from Alberta to the Pacific Coast is presently under construction and will be completed in August 1953 with an initial capacity of 120,000 bbl. of crude oil per day. Plans are presently under way to increase the capacity of the existing Interprovincial Pipe Line from Alberta to the head of the lakes and to extend this line from its present terminus at Superior, Wis., into the refining centers of Ontario. In the light of this present and anticipated pipe-line construction and expansion, plans are already under way to further increase refining capacity.

Some authorities have recently estimated that Canada's population should reach 30,000,000 by 1970. If this materializes, Canada will require refining capacity by 1970 in excess of 1 million barrels per day, supplied largely by indigenous crudes, if the present oil-discovery rate continues.

Oil Industry Making Progress In its Public Relations

by H. S. M. Burns

H. S. M. BURNS
President, Shell Oil Co.

WITH a new federal administration, certain changes are to be expected, and many of these may be welcome changes for business. However, we cannot expect a sudden and magic removal of our problems of public and government relations.

We did enjoy relative freedom from those problems during the war, when the government and certain segments of the public set aside criticisms in recognition of the tremendous job we were doing. But soon after the war was over, we again found ourselves combating the revived issues of cartels, divorcement, tidelands, and depletion deduction.

Now we are giving a better account of ourselves. We are learning how to tell our side of the story, and how to demonstrate that we are doing an even bigger, better job than we did at the height of World War II. We have learned that the people with the poorest opinion of us are those who know least about us, and we have therefore learned to talk more plainly and frankly about ourselves. The man in the street today knows considerably more about the American oil industry than he did in the 1940's. As his knowledge of us grows, his opinion tends to improve. We can see heartening evidence of this in the generally favorable treatment that the press has given us in recent editorial discussions of the cartel case.

Our public-relations efforts of recent years are beginning to bear fruit in better understanding and more good will between the oil industry and the public. We must not relax those efforts, but rather, direct them ever more effectively. We can expect continuing and new attacks, because the realities of life offer no escape from carping and warped criticism. We can turn aside these threats only by being alert and flexible, and by continuing our efforts toward progress and increased service to the nation.

Needed Natural-Gas Expansion Hampered by Federal Controls

by K. S. Adams

K. S. ADAMS
Chairman of board, Phillips Petroleum Co.

THE demand for natural gas has skyrocketed since 1940 to where it now contributes better than 20 per cent of the total national energy supply. The Gas-Planning Division of the Petroleum Administration for Defense estimates that by 1955 a completion of the present plans of our country's utility companies would result in natural gas representing 99.2 per cent of their total sales.

But this same report goes on to say—"Substantial quantities of uncommitted proven reserves are existent at the present time but there has been a reluctance on the part of producers to contract them for price and other reasons," and that ". . . further delay in closing contracts may serve to delay conversion of gas demand into actual connected loads."

Gas reserves are being depleted and producers are unwilling to pay for present-day high-cost exploration and drilling in order to find new reserves to commit for the support of an expanding demand which offers an uncertain profit incentive. The solution to overcome this unwillingness is obvious. In its survey, PAD found that the consumers' prices for coal and oil, natural gas' competitors, have advanced

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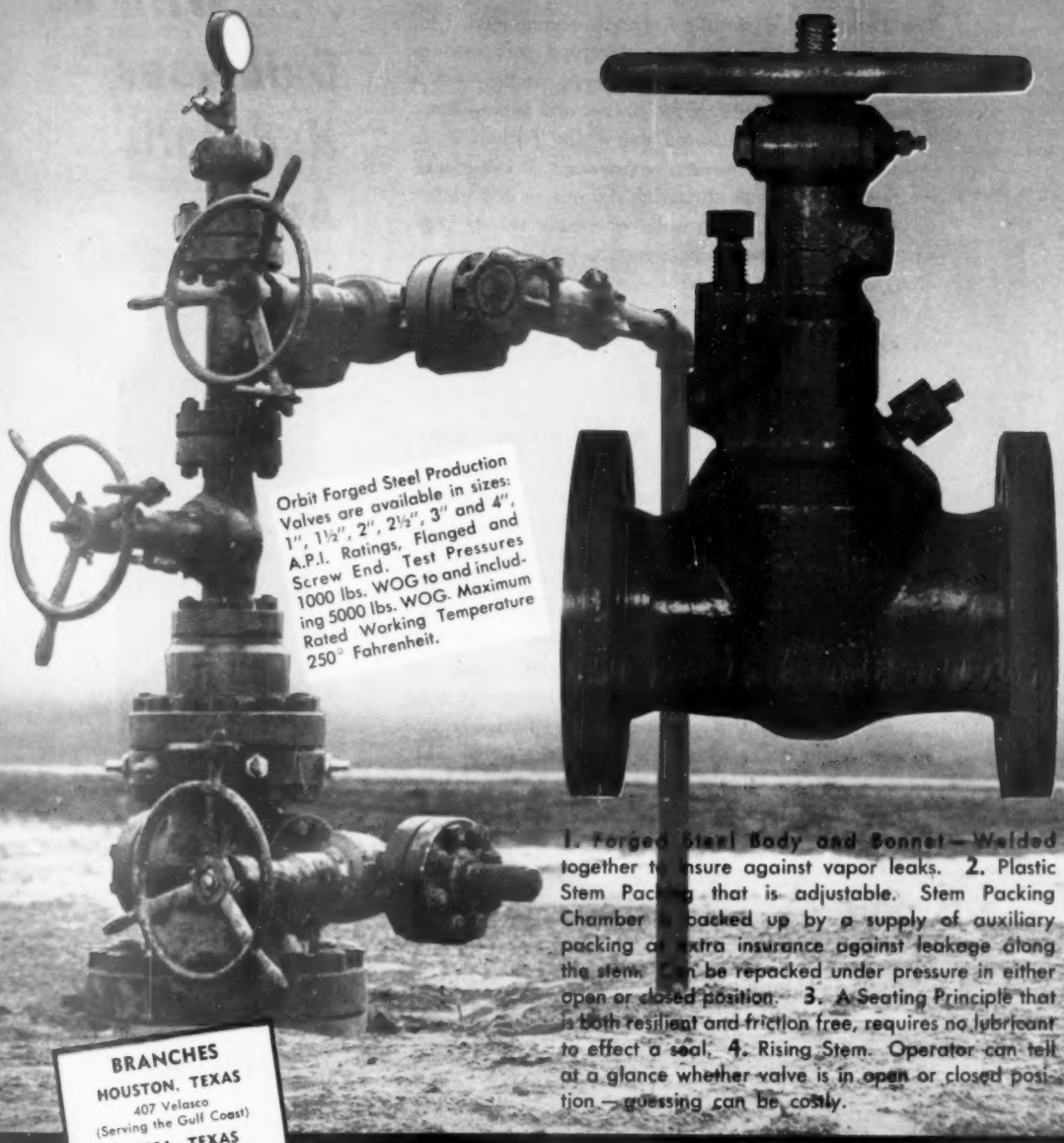

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about 75 per cent in the past 10 years while the consumers' price for natural gas has actually declined.

There is a further reluctance to take a chance on having the price of gas regulated by a federal agency and the move to extend the jurisdiction of the Federal Power Commission to producers and gatherers of natural gas who sell to interstate pipe lines has provided an additional incentive for withholding supplies for local use. In 1951, over $1,250,000,000 was invested in new chemical plants and refineries in Texas and Louisiana. It appears that the final tabulation for 1952 will show that the industrial expansion in that area kept pace with 1951. A dominant factor responsible for this industrial growth near the source of natural gas is the encouragement given by the natural-gas producer in order that he might sell his product locally at its market value and also avoid any immediate or known federal regulation.

In a talk which I gave over a year ago federal control was labeled "The Sugar-Coated Route to Less Natural Gas at Higher Prices." Developments are now supporting this statement.

Closely linked to natural gas are petrochemicals—another phase of our industry that will outstrip the average of our nation's industrial expansion during the next several years. The liquid products from natural gas have been a springboard for this "glamour child" of the petroleum family.

The chemical industry should expand by 30 to 40 per cent during the next 5 years. Chemicals are replacing many products that have a high labor content, and in an economy that has high labor costs the incentive for the development of new petrochemical ventures is magnified. The intensified research and development of petrochemical synthesis has shown that the more valuable products are the result of the extreme in selection and that new petrochemicals often replace ones previously selected. Among the specialty chemicals will doubtless be seen the greatest growth for petrochemicals.

Continued Growth in Products Lines Assured

by C. R. Younts

C. R. YOUNTS
President, Plantation Pipe Line Co.

DURING 1953, the pipe-line industry will continue to grow and expand. Throughputs in existing lines will be higher and many new projects will be brought to completion.

In Plantation Pipe Line Co. we have undertaken to meet the increased demand and anticipate future demands for petroleum products in the Southeast by more than doubling our product-pipe-line capacity during 1951-1952. Some of our shipper companies have been delayed in obtaining tankage but most of these projects will be completed in the near future. Several new shippers have started making shipments through our system during the past year. Our throughput in 1952 was not quite as high as expected due to this delay in our shippers obtaining the necessary terminaling facilities, but it is anticipated that our throughput will be sizably increased during 1953.

A large-diameter carrier is presently under construction from the Texas Gulf Coast area to Baton Rouge and this, coupled with an enlarged and modernized dock for handling water shipments which move up the Mississippi into Baton Rouge, will facilitate receiving sufficient quantities to take care of anticipated demands.

Most pipe lines are employing new techniques in the construction of remotely controlled stations. Plantation is now doing this on its lateral lines. This work will be completed early in 1953. Both microwave and leased-wire media are being utilized on these projects.

The pipe-line industry made great strides during 1952, and we feel that 1953 will be another year of growth and expansion.

L.P.G. Industry to Continue Amazing Growth

by Howard E. Felt

HOWARD E. FELT
Vice President, Warren Petroleum Corp.

THE liquefied-petroleum-gas industry in 1952 presented to the petroleum world another year of uninterrupted growth and progress.

In retrospect and prospect this fastest growing child of the petroleum and gas industry can be summarized briefly as follows:

1. Sales reached an estimated 4.2 to 4.5 billion gallons—a gain of 7 to 8 per cent—exclusive of the product used for rubber manufacture. The largest market—domestic and motor fuel use—is estimated to have increased almost 10 per cent. Expansion of natural-gas lines reduced slightly the L.P.G. demand for utility purposes and likely will make further slight inroads in the future, due to its lower cost. The net result was an over-all demand increase, not as spectacular as the two previous years, but one which gives to the industry a more solid and healthy foundation for the future.

2. The industry in 1952 made very substantial progress in correcting its greatest handicap to continued solid and healthy expansion. That handicap has been the lack of adequate and flexible storage. An estimated 3,000,000 bbl. of underground storage was created or started by the end of 1952 with still more to be developed in 1953. The minimum job, however, is just about half done if the industry is to save enough of its steady, daily current production in the summer to take care of peak winter demands of

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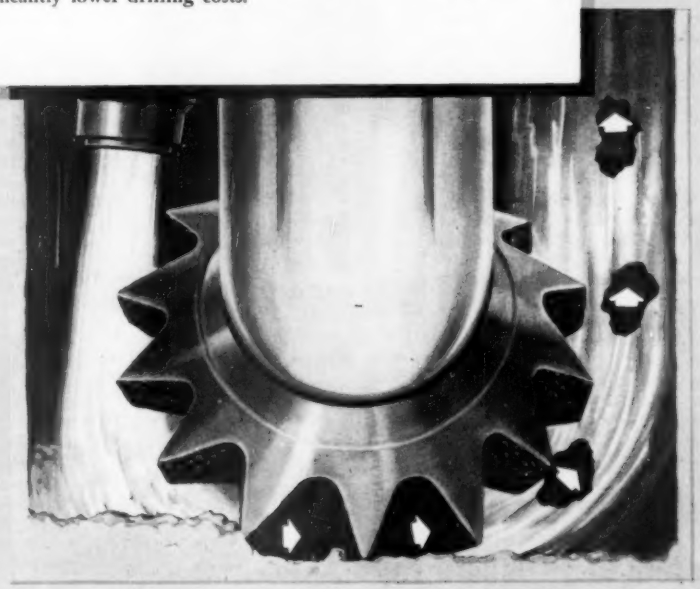

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the still rapidly increasing domestic-fuel load.

3. The year just closed also saw more adequate plans made in the industry with reference to transportation of L.P.G. The industry further exploited the use of marine and pipeline transportation and, at the same time, received greatest delivery of tank cars—some 2,600—to boost its pressure car fleet to approximately 17,000. A lesser number is estimated for delivery in 1953, but, if properly used, the industry should have ample cars for the immediate future.

4. All indications point to an adequate increase in production. In fact, the industry is faced with a full-sized sales and service job if it is to make efficient disposition of the production of presently projected plants, some of which will not come on stream, however, until late 1953 or early 1954.

5. The awareness of the selling job facing the industry is exemplified by the remarkable progress of the L.P.G. promotion program, now entering its third year. This program deserves and must have the full support of all producers and marketers of L.P.G. and can be expanded to the greater profit of the entire industry if its membership (and contributions) are further increased.

The above adds up to the fact that the L.P.G. industry has never been in such a good position, and the future rests largely on the continuation of the basic and constructive efforts so evident in 1952.

Shipping Distances of Some Mountain Refining Plants Are Uneconomical

by M. H. Robineau

CRUDE oil is still in oversupply in the Rocky Mountain area. The new Platte pipe line to the East will relieve this situation, but, with the vast amount of exploratory work under way, it is reasonable to assume that crude-oil supplies will be plentiful or at least adequate for many years to come.

With the completion of various expansions at Billings, Mont., Casper, Sinclair, and Cheyenne, Wyo., and Denver, we find more refining capacity than is needed for the area. As a result, many refineries are shipping to uneconomical distance. The new products pipe line from Sinclair, Wyo., to Salt Lake City, connecting with the Standard Oil Co. of California pipe line to Pasco, Wash., will relieve this situation, particularly if an additional link is constructed connecting this line with the Wyco pipe line at Cheyenne and the Frontier refinery at that point. Market demands should increase during the coming year in line with the general trend.

M. H. ROBINEAU
President, Frontier Refining Co.

As a whole, the prospects for the Rocky Mountain area look good for the coming year.

Latest Scientific Developments Are Adapted to Products Pipe Lines

by D. B. Hodges

THE year just passed was characterized by substantial expansion in products-pipe-line capacity and by marked advances in the techniques of products-pipe-line operation.

According to the Petroleum Administration for Defense, a total of 7,588 miles of products pipe-line construction has been approved since the beginning of the controlled materials program. Projects totaling 4,780 miles have actually been started and completions during the calendar year 1952 are estimated at 2,000 miles.

D. B. HODGES
Vice president, Shell Oil Co.

Some of this expansion augmented capacity into areas already served by pipe line; in other cases, entirely new territory was opened up to this efficient and economical means of transportation.

On the technical front, latest scientific developments were being adapted to pipe-line operation. Microwave radio transmission was establishing a place as a medium for remote control of pump stations. Radioactive isotopes were successfully used as tracers to identify batch interfaces. Electronic "brains" and magnetic tape-recording machines were simplifying and expediting terminaling operations.

Less glamorous, but no less important, developments also added their bit to products-pipe-line efficiency. Sump-bottom tanks have reduced the amount of storage required for multiproduct operation. Improvements in meters and in strainer and filtration equipment assure greater accuracy in stream measurement. The use of special separation scrapers in copper-mandrel welded lines promises reduced contamination of critical products. Development of effective mechanical seals has largely eliminated problems incident to the handling of unblended propane.

Generally, effort and research in the products-pipe-line field seem to be directed toward increased safety and improved efficiency. Emphasis is on simpler and more effective automatic control with its attendant safety and economies. The trend is toward fully automatic operation and the end of 1953 should find many products-pipe-line pump stations operating entirely by remote control with a fully automatic pipe line perhaps not too far distant.

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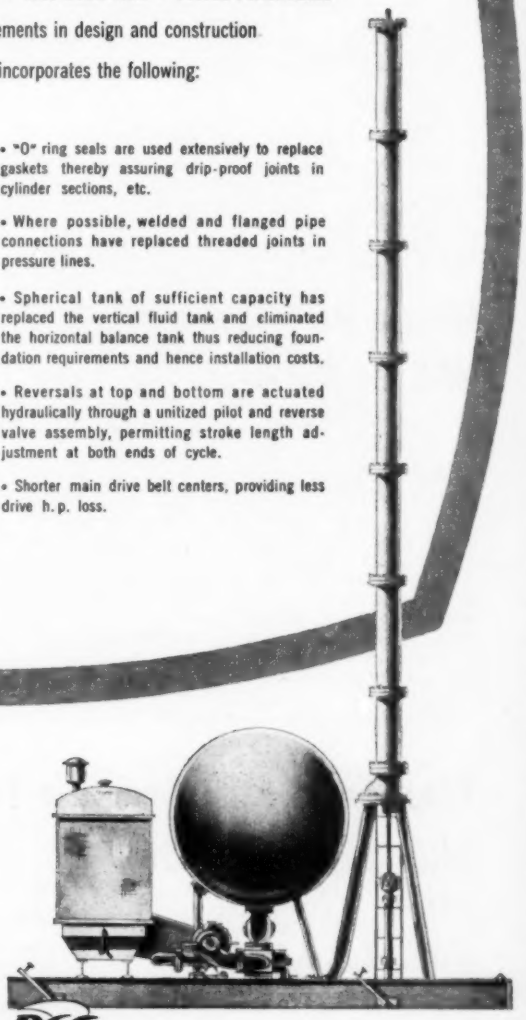

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Government Controls Bring Major Problems to Pennsylvania Grade Area

by George J. Hanks

GEORGE J. HANKS
Chairman of the board, South Penn Oil Co.

THE Pennsylvania Grade crude-oil area is confronted with problems resulting from governmental controls over materials and supplies, crude oil and refined products. While they have long been brewing they have now developed into major problems.

There is a definite unfavorable economic factor resulting from the market price for Pennsylvania Grade crude oil having been frozen for 25 months at a very low level, while all items included in the cost of production have steadily increased. This unfavorable factor is working against our producing industry, tending to squeeze it out of existence, and thereby imperiling the entire Pennsylvania Grade crude-oil industry.

Many additional problems confront the area. For example the high and steadily increasing costs of transportation have grown into serious handicaps. Relief is sought through selection of less expensive methods of transportation. Refiners and marketers are working intensively along this line.

The trend in Pennsylvania lubricants will continue toward quality improvement, which objective is firmly illustrated by the large amount of new-process construction completed in 1952, plus that which is under way and the sizable number of new projects already announced for 1953.

Among new items is the definite trend toward decrease in the number of lubricants required to properly service all equipment. Multipurpose greases are now on the market and some are demonstrating success. Their objective is primarily to reduce inventories, both in the plants and fields, eliminating to the maximum, slow-moving stock.

Record Performance of 1952 Will Be Bettered This Year

by R. G. Dunlop

R. G. DUNLOP
President, Sun Oil Co.

BARRING an intensification of hostilities in Korea, or new outbreaks of fighting in other parts of the world, prospects for the petroleum industry in 1953 seem bright.

There will not be a strong upsurge in demand such as the industry experienced immediately after the Korean war started but the expected increase in demand of from 3 to 5 per cent over last year still will present a sizable volume of new business.

Thus it appears that the record-breaking performances now being reported for virtually all phases of the industry for 1952 will be bettered during the year ahead. For one thing it seems likely that the industry will at least equal the record total of more than 46,000 wells drilled in 1952.

Adding to the bright picture for 1953 is the hope that the new administration will bring greater stability to the American dollar, create a more realistic tax structure giving recognition to economic incentives, and bring an end to the disruptive influences with which the industry has had to contend for so long.

West Coast May Again Be Faced With Excess Fuel Oil

by W. L. Stewart, Jr.

W. L. STEWART, JR.
Executive vice president, Union Oil Co.

HISTORICALLY there have been frequent surpluses of residual fuel oil on the West Coast, and there is at present a possibility of a recurrence of this problem.

Because of the high level of refinery operations currently needed to meet rapidly growing gasoline demand, refiners are in a vulnerable position in the event of a decline in fuel-oil markets. The demand for gasoline and mid-barrel products during the next few years is expected to increase further, while the demand for fuel oils may re-

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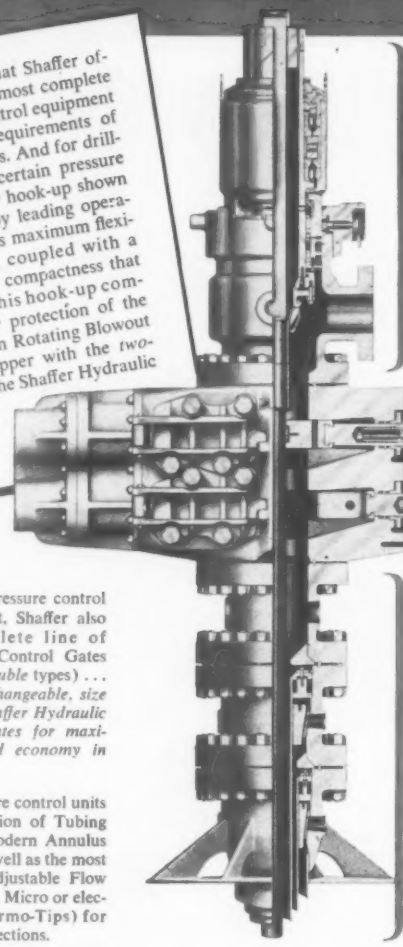

In addition to the pressure control units shown at right, Shaffer also provides a complete line of *Mechanical* Cellar Control Gates (both *Single* and *Double* types) . . . *and rams are interchangeable, size for size, between Shaffer Hydraulic and Mechanical Gates for maximum simplicity and economy in field operations.*

Other Shaffer pressure control units include a full selection of Tubing Heads (featuring modern Annulus Flange types) . . . as well as the most complete line of Adjustable Flow Beans (with Conical, Micro or electrically-heated Thermo-Tips) for use in the flow connections.

1 ***THE SHAFFER COMBINATION ROTATING BLOWOUT PREVENTER AND STRIPPER*** provides—*in one unit*—every necessary feature for successful and simplified pressure control while the drill string is in the hole . . .

- **It *automatically* maintains a continuous seal around different shaped elements in the drill string — square, hexagon or round — regardless of whether the string is rotating, being raised, lowered, or is stationary.**
- **The seal *automatically* expands and contracts to fit the varying diameters of drill pipe, tool joints, couplings and drill collars.**
- **Bits, reamers and other abnormally large tools can be easily passed through the unit by merely turning the Quick Releasing Bonnet 1/6 turn and removing the sealing assembly. It's simple, quick!**

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2 ***THE SHAFFER HYDRAULIC DOUBLE CELLAR CONTROL GATE*** provides—*in one unit*—rams for shutting off the well when pipe is in the hole, as well as rams for sealing off open hole.

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- **Even in sizes as large as 13⅝" (12" Series 900) the complete unit, including *two* ram compartments, requires only 30" cellar height—smaller sizes even less!**
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3 ***SHAFFER LANDING AND CASING HEADS*** **are recognized throughout the industry for their rugged dependability and adaptability to various suspension and pack-off requirements. The bottom unit at left is a Shaffer Base Head from which two strings of casing are suspended and packed-off with maximum compactness . . . and in the Head above it a third string is suspended and packed off.**

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main essentially constant or even decline. This increased demand must be met by processing additional crude oils obtained from new local discoveries or by importation and would result in a surplus of fuel oil under our present day refining practices.

One solution to this problem is to convert fuel oil into products which are in short supply, and the refiners should have sufficient flexibility to keep the supply and demand for products in balance. There are several means available to the industry to reduce fuel-oil production. One of the methods being used currently is vacuum topping of residual stocks to produce gas oils for catalytic cracking, and visbreaking of the bottoms produced therefrom. Additional vacuum topping facilities will be put into operation during 1953, and construction will be started on others. A second means for converting fuel oil into other products is to coke the bottoms produced from vacuum topping. The distillate produced can be catalytically cracked into gasoline or hydrogenated into burner oil or diesel.

Whereas the above processes for converting fuel oil into other products are available to the industry today, other techniques or processes may be developed which will simplify the conversion of fuel oil into other products that are in short supply.

World Contributions of the Oil Industry Should Be Reemphasized

by Sidney A. Swensrud

SIDNEY A. SWENSRUD
President, Gulf Oil Corp.

AN important problem facing the petroleum industry in 1953 will be the task of reemphasizing the great contributions which it has made and is making in creating and stimulating economic development and in raising living standards throughout the world. The whole petroleum industry has been the victim of an unfavorable publicity attack by the outgoing administration in Washington as a result of the so-called cartel investigation; it must endeavor to overcome the unfortunate effects of this by broadcasting the facts and making it clear that oil companies doing business abroad have acted and are continuing to act as good citizens in all the countries in which they operate.

American oil companies must make known the dynamic role they are playing as a catalyst generating economic and social progress. Oil companies risking their capital in foreign operations and bringing their management methods and technological advances to bear upon the problems have not only been beneficial to the United States but have been of immeasurable value to the foreign countries themselves. In many backward petroleum-producing areas, in addition to stimulating many new economic advances, numerous hospitals, schools, and improved living conditions have been sponsored and supported by oil companies keenly aware of their social responsibilites.

Here in this country the oil industry must focus attention on its ready acceptance and adoption of technological advances which have resulted in abundance of supplies and in unbelievable cost savings to the consumer, to say nothing of vastly improved product qualities. Drastic changes and shifts in demand have been met quickly and efficiently, with the result that nowhere in the world is the per capita consumption of petroleum so high as in the United States and the cost to the consumer so reasonable.

Incentive of Better Prices Needed in Western Operations

by R. G. Follis

R. G. FOLLIS
Chairman of the board, Standard Oil Co. of California

THE oil economy of the West Coast has been thrown materially out of balance in the past 2 years, with the continued growth and development of the Pacific Coast. This particular region of the United States, long a leading oil-producing area, has slipped from its traditional surplus, exporting position. Although crude-oil production totals on the West Coast have slowly climbed, they have been outstripped by faster-growing demand. This condition has been largely brought about by (a) rapid influx of population all along the Pacific Coast; (b) buildup of industrial capacity; (c) defense and Korean war demands upon West Coast oil supplies.

To meet this situation in 1952, the oil companies began a program of crude imports which built up during the year to reach an average rate of 50,000 to 60,000 bbl. during the fourth quarter of the year. There is no doubt but that these imports averted a serious shortage in this area, even though they were not enough to supply all products the military desired to pick up in District V.

Looking ahead, it does not seem likely that California production, the only local crude source, will be able to catch up with demand at least until legal obstacles are removed and development

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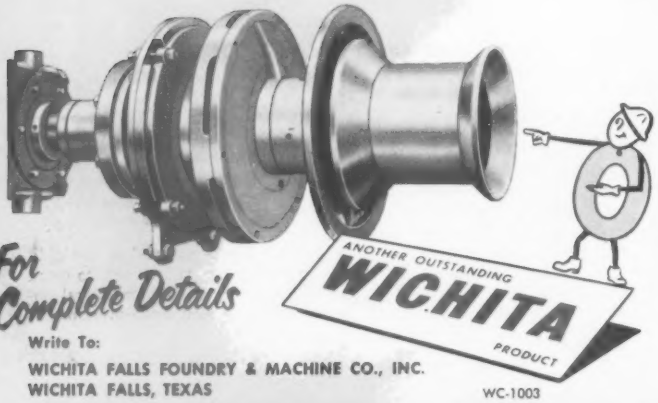

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WHAT'S AHEAD?

of tideland resources can be effected. Ceiling price relief is not only necessary to continued imports, but would also spur exploration, development, production from marginal fields, and additional secondary recovery efforts. However, it still looks as though the West Coast will have to continue to import substantial quantities from offshore sources in 1953. These supplies will come largely from Sumatra and Arabia. Thereafter, it probably will come in increasing amounts from Alberta via Trans Mountain Pipe Line.

1953 Will Bring Further Pipe-Line Expansion

by J. L. Burke

THE year 1952 was the biggest year in pipe-line history from the viewpoint of traffic volumes. Since World War II crude-oil and products pipe lines have increased their volume of traffic more than 55 per cent. During this postwar period of huge expansion and growing competition, there has been a constant scarcity of materials which necessitated close cooperation between industry and government to assure the best allocation of essential supplies. This cooperation removed and avoided transportation bottlenecks and helped prevent rationing of oil products.

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J. L. BURKE

President, Service Pipe Line Co.

As the oil industry expands to meet additional requirements for petroleum and petroleum products, the pipe lines must grow to feed their continuous stream of crude into the refinery stills and move refined products to market. The outlook for 1953 is for continued expansion and modernization of pipeline facilities to handle ever-increasing demands to move more oil with greater efficiency.

WHAT'S AHEAD?

Excess Fuel Oil and Higher Octanes Confront Independent Refiner

by Dr. I. Arthur Anson

SINCE 1949 the oil-refining industry generally has not earned reasonable returns. It has reached for future profits by investing borrowed money on new facilities and new techniques. There have been withdrawals from the race by shutting down or selling out. Those who remain are confronted with the need of additional and expensive installations to overcome two severe obstacles: (1) the low price of fuel oil, and (2) the call for higher octane ratings of gasoline.

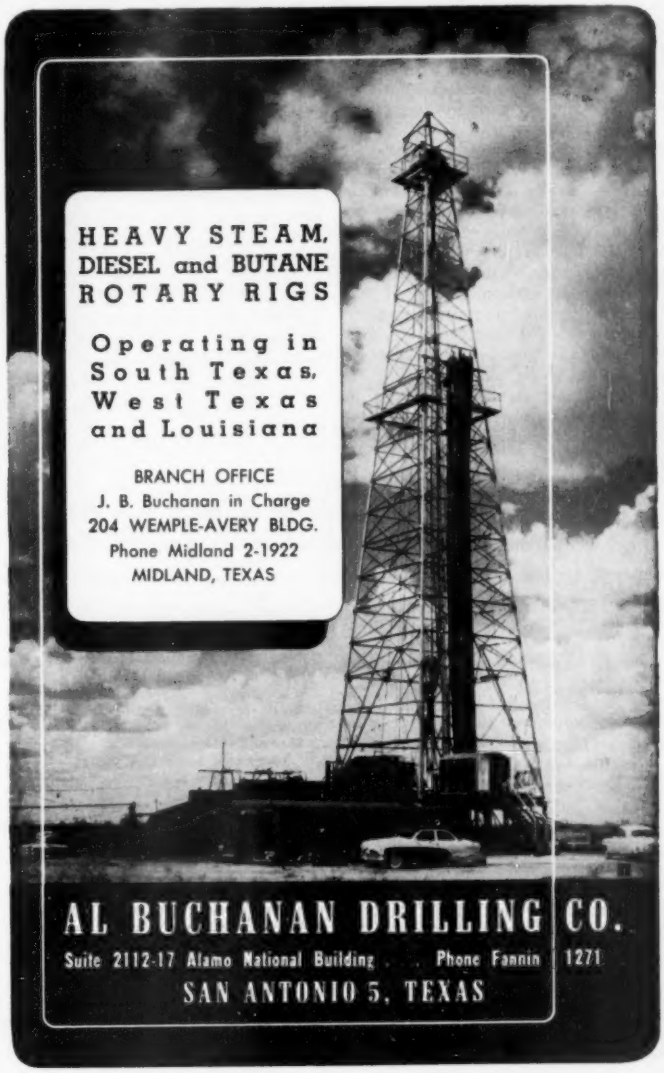
DR. I. ARTHUR ANSON
Vice president, Bell Oil & Gas Co.

In previous periods of low prices for fuel oils, there was hope of improvement, repeatedly realized, as in February 1920, when fuel sold for over $4 per barrel, compared to $0.60 in September 1919. Similar reversals have taken place since 1920. In December 1950, fuel oil brought $1.80, compared to $1 quoted today, and going lower. Today there is no hope for fuel oil. In addition to coal, there are two new competitors, permanent and formidable, namely, gas and water.

In the past some have regarded the gas lines as temporary competition, expecting the gas fields to play out. Today there is no prospect of exhaustion. In fact, there is likelihood of increased supplies. Water power turned into electricity will further reduce the number and size of steam generators and will thereby reduce the demand for fuel oil.

Refiners are forced to convert the fuel-oil fraction into something merchantable, such as coke, or pitch, or paving materials, or perhaps into gasoline, when hydrogenation technique has been developed. In times gone by, refiners could wait for price betterment on fuel oils. But no more. Large sums of money must be spent to substitute salable products for unsalable fuel oil.

In the octane race, the situation is equally serious. Catalytic cracking, like thermal cracking 20 years ago, is not enough. Catalytic reforming is needed to produce high-octane gasoline from low-octane straightrun naphtha. Vast funds must be spent by oil refiners everywhere for catalytic cracking, and for catalytic reforming, in addition to whatever is done to replace fuel with a merchantable product. These are all "musts," without taking account of investments for petrochemicals, or any steps to produce valuable products out of the gases that have generally been described as gas loss.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NEEDED: MORE ALKYLATE CAPACITY

Refining Progress Directed Along Three Fronts . . .

1. Improving product appreciation

2. Reducing operating costs

3. Increasing flexibility and selectivity of operation

by George Weber

THE year 1953 will find United States refiners meeting a normal increase in demand with products of improved quality all along the line. The construction program, which has lagged due to materials shortages, is expected to pick up speed, and before the year is out the industry will have moved closer to the scheduled expansion in basic capacity. Progress is expected in many research and development projects aimed at improving product appreciation, reducing operating costs, and increasing flexibility and selectivity of operation.

While the year-end goal for new construction, set by Petroleum Administration for Defense, will not fully be met in basic crude capacity, refiners are more than keeping up with schedules in expanding catalytic conversion facilities. The nation's ratio of cat cracking capacity to crude capacity will inch upward, and a new record will be chalked up in construction of new cat reforming units.

One serious deficiency remains in expansion plans for the new year. New alkylation capacity, despite the programs undertaken by many refiners, is still considered insufficient to provide the necessary blending stocks for aviation gasoline to meet projected military and civilian requirements.

Capacity to Top 8,000,000 Bbl. Per Day

A recent survey conducted by PAD indicates that basic crude capacity will reach 8,156,381 bbl. per calendar day by January 1, 1954 *(see The Oil and Gas Journal, December 22, page 144)*. The nation's total crude capacity is expected to exceed 8,300,000 bbl. daily during the following year. This survey, compiled from estimates submitted to PAD by individual companies, shows a prospective catalytic cracking capacity of nearly 2½ million barrels per calendar day by the end of this year. Catalytic reforming will show the greatest percentage increase of all processes with total capacity expanding over 75 per cent from present, to reach 317,000 bbl. per calendar day before the end of 1953. New facilities for light-ends recovery and polymerization will closely follow the improvement in catalytic conversion capacity.

The gradual decline in thermal cracking operations since 1947 will likely continue through 1953, with new capacity consisting almost entirely of coking units. New interest is evident throughout the country in producing improved asphalts and in developing new specialty products from the heavy-crude fraction. Increasing volumes of light hydrocarbons will continue to go into petrochemicals, and the recovery and utilization of sulfur will improve to some extent.

Lube Oils an Exception

Lubricating oils represent the only major product class which will not see substantial capacity increase. The decline in exports following the major construction program for lube-oil plants in Europe has caused the domestic industry to lag behind the expansion program desired by the Government. Even the modified program which calls for 15,000 more barrels per calendar day in production capacity by the end of this year, plus 13,000 bbl. per calendar day in 1954, will not be approached on the evidence of refiners' plans at present. With estimates for total 1953 United States demand including exports ranging from 158,000 to 165,000 bbl. per calendar day, refiners cannot see their way clear to invest in added capacity. The latest survey of the industry by National Pe-

NEW BASIC REFINING CAPACITY
(Barrels per day)

	PAD district					
	1	2	3	4	5	Total
Crude topping:						
Total approved	229,100	466,770	448,115	15,892	111,665	1,271,542
Approved but not started	20,000	112,220	18,460	3,100	28,665	182,445
Schedule of completions:						
Completed 1-1-53	29,000	112,390	110,150	9,752	19,000	280,292
To be completed (estimated):						
Between 1-1-53 and 7-1-53	52,210	149,960	91,625	2,540	22,000	318,335
Between 7-1-53 and 1-1-54	82,890	100,420	149,090	3,600	31,165	367,165
Later than 1-1-54	65,000	104,000	97,250	.....	395,000	305,750
Total	229,100	466,770	448,115	15,892	111,665	1,271,542
Cat cracking:						
Total approved	152,450	193,478	392,400	21,900	67,330	827,558
Approved but not started	8,850	37,270	68,100	6,400	7,160	127,780
Schedule of completions:						
Completed 1-1-53	7,500	72,298	156,740	12,500	10,870	259,908
To be completed (estimated):						
Between 1-1-53 and 7-1-53	32,100	71,100	49,060	3,000	29,660	184,920
Between 7-1-53 and 1-1-54	69,000	40,080	102,800	6,400	6,000	224,280
Later than 1-1-54	43,850	10,000	83,800	.....	20,800	158,450
Total	152,450	193,478	392,400	21,900	67,330	827,558
Cat reforming:						
Total approved	50,350	98,890	85,985	600	36,090	271,915
Approved but not started	14,350	44,110	22,150	600	9,090	90,300
Schedule of completions:						
Completed 1-1-53	1,500	4,880	21,320	.....	.....	27,700
To be completed (estimated):						
Between 1-1-53 and 7-1-53	.....	.....	19,965	600	10,000	30,565
Between 7-1-53 and 1-1-54	34,500	40,900	6,100	.....	26,090	107,590
Later than 1-1-54	14,350	53,110	38,600	.....	.....	106,060
Total	50,350	98,890	85,985	600	36,090	271,915

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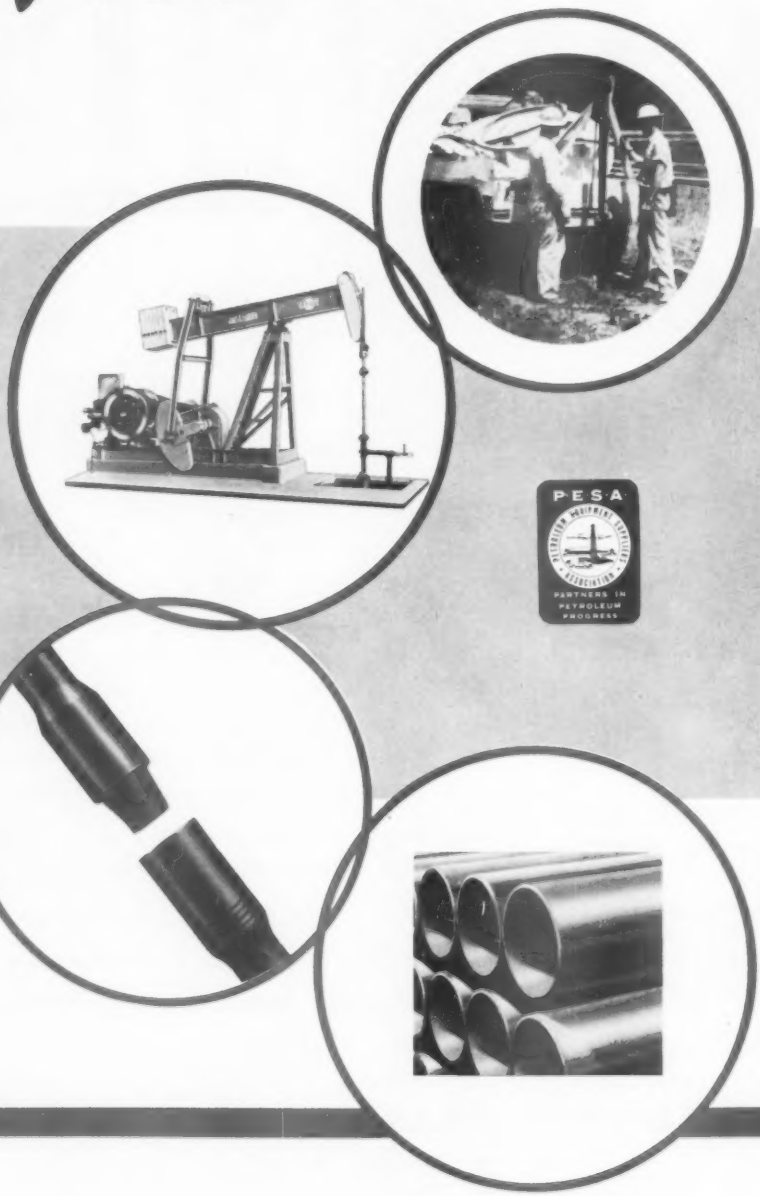
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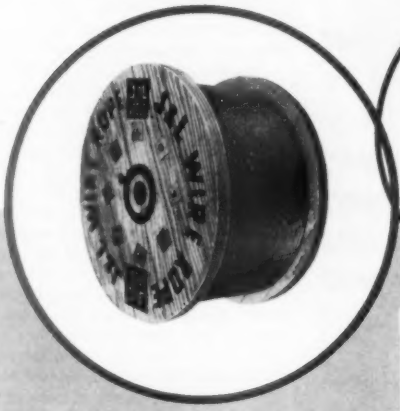

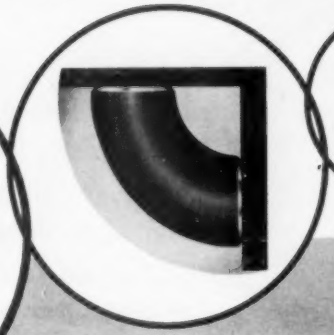

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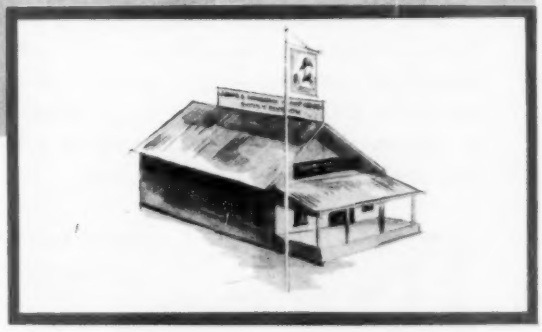

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troleum Association last spring showed a total productive capacity of 187,000 bbl. per calendar day.

The softening market in lube oils will contribute to increasing attention on quality during 1953. Improved additives will come into use and the additive dosage will in all probability increase. A trend toward greater selectivity of base stocks, and expected improvements in existing solvent-extraction techniques will result in the marketing of higher-viscosity-index oils.

Middle distillates will continue a strong demand. The availability of high-quality diesel fuels will be improved by further application of solvent-extraction techniques and the recent introduction of an additive for upgrading fuels to higher cetane numbers.

Distillate jet fuels will pose no supply problem during the coming year. On the contrary, offerings by refiners substantially exceeded military needs for the first half of 1953. The continued pressure expected on motor-fuel octanes will contribute to the availability of jet fuels, since the diversion of low-grade naphthas to jet-fuel blending will permit some refiners to improve the octane of their remaining motor-fuel blends. The outlet of residual fuels for gas turbines is considered as negligible for the coming year. The presence of metal contaminants, even in small traces has ruled out this potential end use for heavy fuel until serious corrosion problems can be solved. Heavy fuels for gas turbines will continue to be tailor made for some time to come, which nullifies the advantage which would be gained from the use of a low-cost product.

The Building Program

Two yardsticks for measuring the current refinery expansion program are the Defense Production Administration's listing of approved certificates granting accelerated amortization on new plant facilities, and the volume of approved applications for new materials for construction processed by PAD. The latter represents a fairly firm index on the industry's plans to add new processing units and to expand existing ones.

From the start of the Controlled Materials Plan on July 1, 1951, to late 1952, projects calling for 1,271,542 bbl. per day of new crude capacity, 827,558 bbl. per day in added cat cracking facilities, and a 271,915-bbl. per day expansion of cat reforming capacity. The accompanying table outlines the over-all program by PAD districts and shows tentative schedules for dates of completion.

These dates are subject to revisions as projects progress. By late last year,

however, it appeared that about 86 per cent of the new crude capacity approved to that date under CMP, was under construction and that roughly half of the total would be completed by mid-1953.

Of the 827,558 bbl. per day in cat cracking capacity approved on the same basis, roughly 85 per cent was completed or under way by the end of 1952, and about 80 per cent is scheduled for completion by the end of this year. Cat reforming projects show a more extended construction program, with 67 per cent of capacity completed or under construction by the first of this year and 60 per cent slated for operation before the end of 1953.

Smaller Refiners Gaining

A breakdown of the new construction covered by materials allocations shows the smaller refiner gaining ground in basic crude-processing capacity. Companies controlling less than 20,000 bbl. per day in total refining capacity in 1951 accounted for about 10 per cent of the nation's crude capacity. This class of refiner is installing about 16 per cent of new crude capacity.

The small refiners are also catching up on catalytic cracking facilities. Whereas companies controlling less than 20,000 bbl. per day in crude capacity operated less than 4 per cent of cat cracking in 1951, they are now building 11.6 per cent of all new capacity in this process, according to the totals shown on materials allocations.

For cat reforming, the reverse is true; it is the large refiners who are catching up, percentagewise, with the smaller operator who has been active in adapting modern processing of this type to his relatively limited operations. Originally, the eight large hydroforming units with combined charge capacity approaching 75,000 bbl. per day, were all operated by companies controlling more than 1,000,000 bbl. per day in basic crude capacity.

Up to last year, construction of modern cat reformers was restricted almost exclusively to small refiners. As a result the ratio of cat reforming to crude capacity in many small refineries rose substantially above that of major plants. While the preponderance of new cat reforming capacity is going into the large refineries, construction of small units is continuing unabated, and the small and medium refiners appear to be maintaining their lead.

On the basis of capacity approved on Forms 26 filed with PAD, refiners with less than 20,000 bbl. per day in crude capacity are building units total-

The *Exclusive*

NATIONAL AIROIL OIL-GAS TANDEM COMBUSTION UNIT

HERE'S WHY:

. . . because NATIONAL AIROIL "Airocool" Tandem Units are *more* than just combustion equipment. They are an *exclusive* Combustion System which has *proved* many more hours "on stream" without shutdown.

"Airocool" Tandem Combustion Units (firing dirty refinery gas; uncut asphalt; refinery fuel oils) hold hot air in the combustion zone until fuel and hot air are mixed thoroughly. This means that combustion takes place in a hot zone; the result . . . increased combustion efficiency with a minimum of excess air.

NATIONAL AIROIL Tandem Units add up to 16% further flame travel *without extending the furnace front* . . . eliminating flame impingement on bridge wall and tubes, allowing longer life for those elements . . . and because of this added flame length secondary air is controlled easily and accurately.

The Tandem Unit is popularly fired with NATIONAL AIROIL Combination Oil and Gas Burners. YOU will realize higher profits from YOUR heaters when Tandem Combustion Units are specified. Detailed literature sent upon request on your business letterhead.

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Work-Saver Pipe Tools

ing about 97,000 bbl. per day which represents about 11.5 per cent of all new cat reforming capacity. Those in the 20,000-50,000-bbl. class are building 75,000 bbl. per day, about 9 per cent of new capacity. The bigger companies whose facilities exceed the 50,000-bbl. per day mark are completing, building, or firmly planning nearly 635,000 bbl. per day in cat reformer facilities, representing nearly 80 per cent of all new construction of this type. This figure corresponds to the percentage of national crude capacity which they control.

These figures, qualified to the extent that they include some projects which may be modified or abandoned, indicate that the independent-refiner class which includes a growing number in the 50,000-bbl. per day category, is actively participating in the current program of expansion and modernization. Although the trend toward larger individual refineries continues, it appears that the smaller plant can remain competitive provided it comprises a balance of modern processing facilities. Of the 135 refineries concerned with new construction under CMP, 10 are complete new plants which range in projected size from 2,500 to 30,000 bbl. per day. It should be noted that construction has begun on only three of these new refineries. Other complete new refineries are known to be planned which do not appear yet in schedules of materials allocation.

Amortization Certificates

In the cases of nearly all major refinery construction or expansion projects planned during the past 2 years, the DPA has granted accelerated amortization for varying percentages of the industry's capital investment. On receipt of most of these certificates, refiners have proceeded to apply for materials allocations and have undertaken construction. A number of certificates were granted for projects which were already under construction or completed before CMP necessitated allocation of materials.

Excluding these latter projects which are now in operation, there remain a fairly large number of planned construction programs which have not yet reached the stage of application for materials. Some of these projects may not materialize for various reasons. While they are not firmly committed, they serve to indicate the volume of refinery construction which may be projected beyond that now covered by allocations.

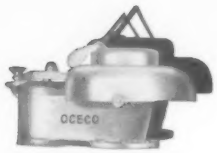
Altogether, these planned projects call for the construction of approximately 375,000 bbl. per day in basic crude capacity, 200,000 bbl. per day

THE OLD DUTCHMEN SAID:
'Een spiering uitgooien om een snoek te vangen'
(THROW A SMELT TO CATCH A PIKE)
THE PRICE OF A SCHLUMBERGER
IS NEGLIGIBLE COMPARED TO THE
LOSS OF AN OIL WELL

WHY OPERATORS PREFER SCHLUMBERGER

Schlumberger Well Surveying Corp. • Houston, Texas

10 Spin



V-113 VENT VALVES control tank breathing, minimizing vapor losses and deterioration of product. High flow capacity. 2" to 12" sizes. ½ oz. to 8 oz. pressure or vacuum settings.

GAUGE HATCHES provide a gas tight closure for gauging, sampling and taking temperature readings. Pedal type hatch opens with a natural straight downward foot movement. Flanged or screw mounting. Also clamping cover type for pressures from 2 ozs. to 15 lbs.

V-114 INTERNAL TANK VALVES are provided with a fusible link that melts when subjected to fire, closing the valve instantly, and cutting off the flow from the tank. 3", 4", 6", 8" and 10" sizes.

OCECO FITTINGS

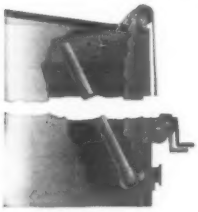
Prevent VAPOR AND FIRE Losses

TYPE "E" FLAME ARRESTORS can withstand long exposure to fire. The "banks" have vertical straight through passages—minimizing entrainment and pressure drop, and are "extensible" for easy cleaning. 2" to 10" sizes.

TYPE "BE" VENT UNITS consist of a V-113 Vent Valve with snuffer, mounted on a Type "E" "Extensible" Bank Flame Arrestor. 2" to 10" sizes. Unsurpassed for efficiency and reliability.

WATER DRAW-OFF VALVES for drawing water from the bottom of storage tanks. Unique double valve construction permits the valve chamber to be drained to prevent freezing, and the working valve serviced without emptying tank. 2" x 1½"; 3" x 2" and 4" x 3" sizes.

V-108 EMERGENCY PRESSURE RELIEF VENTS provide instant relief for excessive internal pressures, resulting from exposure fires, etc. Furnished in 6", 8", 10", 15¼" and 20½" sizes.



SWING LINE EQUIPMENT—complete facilities including heavy duty tank nozzle; efficient double elbow swing joint; swing pipe; cable clamp; cable; sheave bracket and internal or external winch.

● Oceco Vents eliminate the free discharge of vaporized liquids. They control tank breathing resulting from temperature changes and pumping – protect the quality of the stored product – and prevent "blow-outs" and "cave-ins". Oceco Flame Arrestors are a positive flame stop – they prevent explosions and fires.

Specify Oceco Fittings *throughout* for *all* your tanks – and get proven, dependable, trouble-free protection for only a fraction of one per-cent of the value of the tank and its contents.

A few of the most popular Oceco fittings are illustrated and described briefly herewith. But send for the Oceco Data Sheets. They give full details and specifications, and complete listings of sizes, weights, dimensions, etc. Let the Oceco Engineers – pioneers in this work – help you equip your tanks for utmost safety and economy.

SEND FOR THE OCECO DATA SHEETS. Ask for sheets on the individual fittings in which you are most interested, or send for the complete set. WRITE TODAY.

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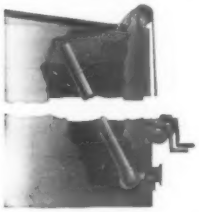

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in cat cracking, and 83,000 bbl. per day in cat reforming facilities. The actual dates of construction and completion of these projects are known in few cases.

Processing Trends

United States refiners will see an active year in the development and initial operation of new processes. Shakedown operations on commercial scale will be given several new techniques in cat reforming, cat cracking, coking, solvent deasphalting, and adsorptive fractionation. Generally, refiners show a tendency to study the operation of the first commercial unit in a new process before firming up construction plans. They will have plenty to watch this year.

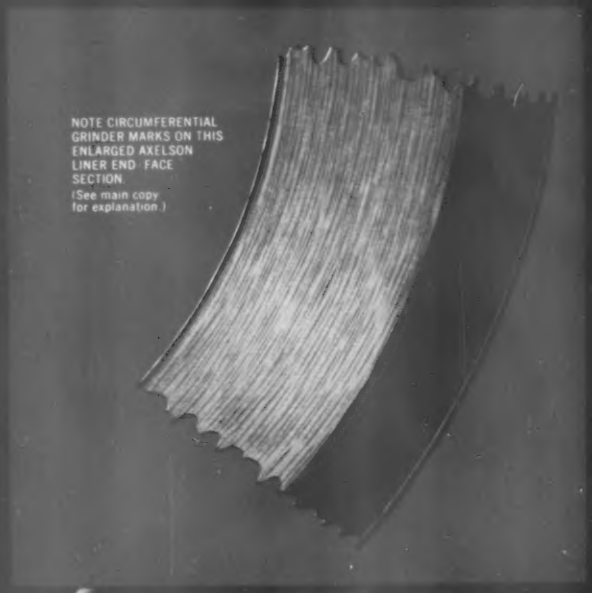
In cat reforming, of the five new processes developed in the past 3 years, only Universal Oil Products Co.'s Platforming process has any substantial operating history. Numerous small units are being planned on the basis of the successful results obtained in small-scale operations during the past 2 years. The first big Platformers will come on stream shortly, and will be watched with interest by refiners interested in large-scale operations.

Catforming, developed and licensed by Atlantic Refining Co., got its first commercial application last August in a small southwestern plant. This year the company will complete a unit of major size in addition to smaller ones.

Fluid hydroforming is now undergoing its first commercial test in a unit built by M. W. Kellogg Co. Several large fluid hydroformers are planned, and much interest is evinced in this prototype unit which adapts the fluidization principle to the older fixed-bed hydroformers.

Socony-Vacuum Oil Co., Inc., Thermofor catalytic reforming process, a moving-bed operation, will probably be in commercial operation before the end of the year, in a unit of major size. Houdriforming will also see its first large-scale operation, in a unit designed for aromatics production. This unit, designed by Houdry Process Co., will be operated in conjunction with an Arosorb unit designed by Sun Oil Co. to extract high-purity aromatics by means of selective adsorption. Before the year is out, Union Oil Co. of California may begin construction of a unit employing the company's own Hyperforming process, another process which will circulate reforming catalyst in a moving bed.

The yields, product specifications, and operating capabilities of these new cat reforming processes will largely be determined this coming year. Much



NOTE CIRCUMFERENTIAL GRINDER MARKS ON THIS ENLARGED AXELSON LINER END FACE SECTION.
(See main copy for explanation.)

AXELSON liners

REGULAR CAST IRON LINER
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DUAX LINER
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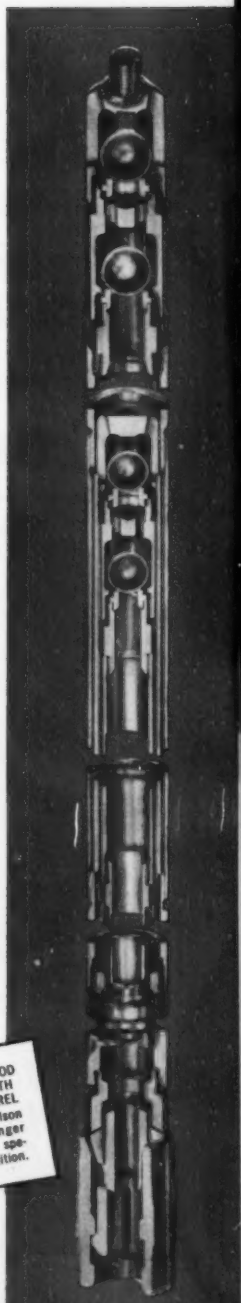
HARDENED CAST IRON LINER
(Alloyed Iron)

provide **POSITIVE** fluid seal against pressure



Axelson's circumferential grinding is a unique precison grinding operation which assures squareness of the end-faces to the bore and, at the same time, incorporates microscopic circumferential grinder marks in the end-faces. When liner end-faces are forced together at installation, these phonograph record-like grooves interlock to provide a lock against radial pressure leakage — a feature exclusive with Axelson.

Uniformity of liner bore is assured by Axelson, through their MICROFINISH honing operation which reduces wearing-surface irregularities to within a few millionths of an inch. Porosity of the casting is not a problem with Axelson because their liners are *centrifugally* cast. Thousands of tests have failed to turn up a single leak in a spun casting.

For complete information covering the three standard types of Axelson liners, write for bulletin, "Axelson Liners."

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AXELSON "RLT" ROD LINER TYPE, WITH TRAVELING BARREL. There is an Axelson deep well plunger pump for every specific well condition.

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PR-21

research is continuing on the development of improved catalysts, and 1953 may well see evidence of still better results to be gained from these studies.

Fundamental research on catalysis is occupying many research laboratories today, and the long-range objective of tailoring a catalyst to do a specific conversion job should be nearer realization a year hence.

Heavy Fuel Reduction

Ways and means of reducing the yield of low-value residual fuels are occupying the attention of refiners generally, and 1953 should bring important new developments to light. Vacuum distillation is under intensive study by several companies who are trying to recover additional overhead fractions from crude bottoms for cat cracking feed stocks. While no spectacular developments affording general application of this practice are expected, the technique will undoubtedly be improved this year.

Coking is attracting widespread interest. At present this interest is focused on a continuous contact coker, designed and built by Lummus Co. This unit is now undergoing its first commercial adaptation in a small southwestern refinery. In common with most units embodying new process departures, this new continuous coker has shown some operating difficulties. The problems involved are not considered fundamental or serious, and corrections in heat input and other factors are expected to result in smoother, successful operation. Many refiners, large and small, are watching this new unit, with the view of adapting the continuous coking process to their operations.

Meanwhile, pilot-plant tests are progressing on another version of continuous coking. Unlike the Lummus process which employs the circulation of a moving bed of coke pellets through a reactor, it adapts the fluidization technique to the operation. Finely divided coke is fed to a fluid bed in a reactor where it contacts a heated stream of residual feed. Coke laydown on the fine carbon particles takes place and net coke is withdrawn from the unit. Work has not yet progressed to a point where developers of this process will discuss probable results, but the development may reach this stage in the next year.

Solvent Extraction

Solvent extraction of the residual crude fraction will also come in for added attention this year. Already contracted is a major deasphalting or decarbonizing unit which will charge an unusually heavy, vacuum residuum. It will employ both propane and butane for extraction of an added increment of heavy stock which can be fed to cat cracking operations.

Attacking the problem of reducing heavy cat cracked stocks, refiners are using both sulfur dioxide and furfural to extract heavy cycle oils. The raffinates resulting from these commercial operations show better cat cracking characteristics than fresh feed, according to the operators. The extract at least represents a smaller volume to be blended off for heavy fuel. At most it shows promise of a potential source of heavy aromatics and is considered prime feed stock for conversion to oil black.

The large-scale production of many synthetic chemicals, particularly from petroleum sources, will bring down the prices of additional solvents to levels permitting their economic commercial use in selective extraction of petroleum fractions. It is likely that refiners will

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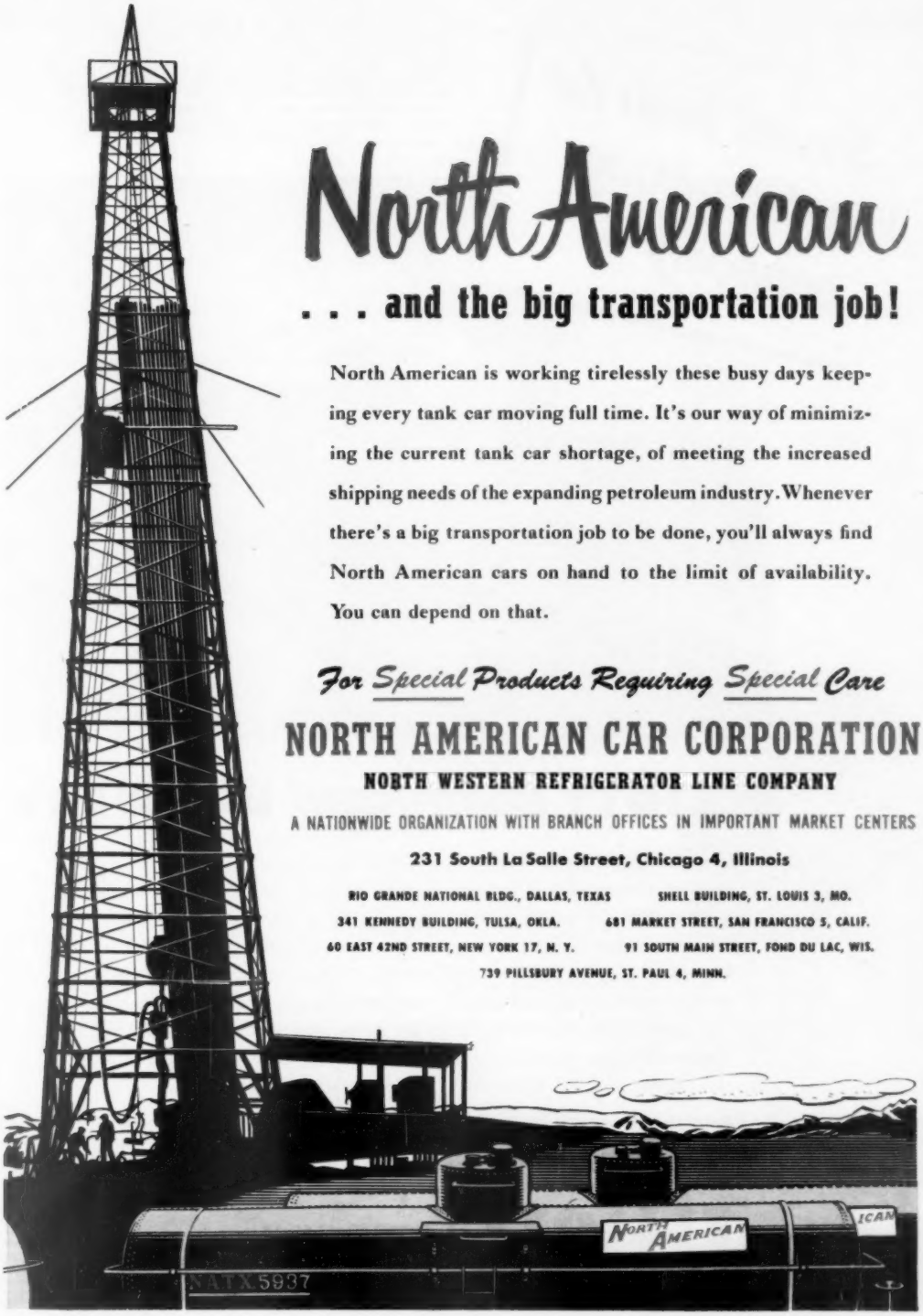

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North American is working tirelessly these busy days keeping every tank car moving full time. It's our way of minimizing the current tank car shortage, of meeting the increased shipping needs of the expanding petroleum industry. Whenever there's a big transportation job to be done, you'll always find North American cars on hand to the limit of availability. You can depend on that.

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Elliott turbine-driven blower serving cat cracker at the modernized McMurrey Refinery, Tyler, Texas. The blower is rated 16,750 inlet cfm with a 25.5 psi pressure rise. The Elliott 1760-hp condensing steam turbine is direct-connected, operating at 6030 rpm.

ELLIOTT *Centrifugal* BLOWERS

The centrifugal air blower pictured above is typical of the many Elliott blowers now serving the oil industry. Similar blowers are handling hydro-carbon gases in the same refineries and are proving to be more reliable and less costly to maintain than displacement type compressors previously used for this service. Meeting the high reliability requirements of refinery service, Elliott blowers and compressors have aided in establishing several outstanding records for continuous performance of a refinery. They are recognized for their dependability and high availability. Since Elliott can furnish the driver as well as the blower or compressor, unified responsibility is a further advantage.

For details, contact your local Elliott representative or write Elliott Company, Jeannette, Pa.

ELLIOTT Company

CENTRIFUGAL BLOWER DIVISION

P2-3a

be able to select solvents for specific uses from an ever-widening range of chemicals.

Combination Processing

The coming year will bring a few instances of closer integration of processing units. Some foresee the combination of atmospheric and vacuum crude distillation, catalytic cracking, and reforming, thermal coking, light-ends recovery, and polymerization carried out in large combination units. Designed to improve heat economies and reduce investment cost in intermediate tankage, such units will probably evolve gradually.

In units following this pattern to date, certain disadvantages have shown up affecting flexibility and on-stream efficiency. These are being solved and the trend toward closer integration continues. One small complete refinery embodying some of these features has been on stream in Canada for over a year. Commercial operation revealed shortcomings not anticipated in the design, but after some modifications, operations have proved satisfactory. Another new refinery incorporating close unit integration is under construction in South Africa. It is due to be completed this year and will be watched with interest.

Long-Range Trends

As motor-fuel octane ratings move upward new techniques will be introduced to improve both antiknock and clean-burning characteristics of gasoline. For the near future, the greatest octane increment will come from wider adoption of cat reforming. The so-called superfuels, high-cost synthetics now produced in the laboratory, will attract growing attention if engine designers continue to increase compression ratios. If the added efficiencies of higher compression engines are applied to increased economy in fuels, these tailor-made hydrocarbons may some day become economical to synthesize for motor-fuel blending.

Fundamental research in this field has revealed that the blending properties of some hydrocarbons vary from their antiknock properties in the pure state. Further studies to be made of this phenomenon may find important commercial application in the manufacture of future motor fuels.

Much research is going forward in the separation of complex mixtures of hydrocarbons. Selective absorption and adsorption, thermal diffusion, and chemical treating promise better efficiency in the future.

In the projected future, the combined demands for jet fuels, diesel fuels, and burning oils will increasingly compete for the same petroleum fractions which make the best cat feed stocks. Hence, added attention will be given to increasing the yield of the middle fraction, at the expense of heavy residuums. Hydrogenation continues to challenge research men, as one of the most promising means of bringing about this conversion. The catalytic combination of bottoms fractions with light ends which together give a carbon-hydrogen ratio similar to that of middle distillates, is considered as a future possibility.

Two factors make hydrogenation uneconomic today: the cost of hydrogen and the high pressures required by known methods. Expansion of cat reforming which produces net hydrogen may bring that factor within economic reach. Increased knowledge of the theory of catalysis may permit the use of lower pressures.

REPETITIVE ACCURACY
Barksdale-Meletron
Pressure Switches
stand guard over pressure changes at El Paso Natural Gas Company compressor stations. They accurately sense the pressure safety limits and initiate electrical action to maintain them. Wherever a pressure or vacuum change must cause electrical response, there is a Barksdale or Meletron pressure switch to perform that function. Write for comprehensive technical bulletin 2M-S.
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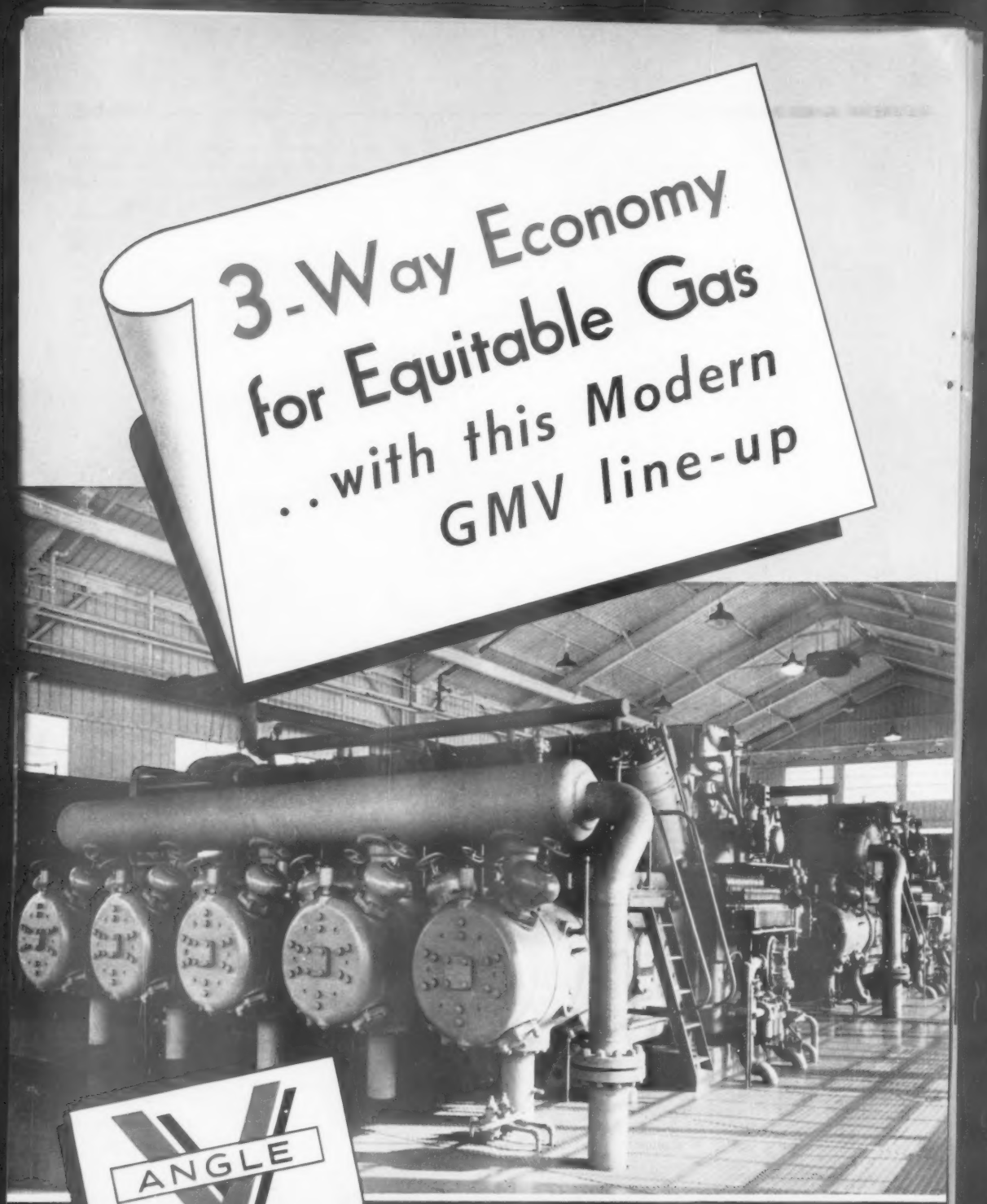

Compressors

New York Washington, D. C. Bradford, Pa. Parkersburg, W. Va.

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EQUITABLE Gas Company's D. P. Hartson Station, south of Pittsburgh, pumps 25 million cubic feet of gas daily from transmission lines into underground storage. It is typical of stations everywhere enjoying multiple savings with modern Cooper-Bessemer V-angle compressors.

Fuel economy . . . Today, Cooper-Bessemer V-angle engines offer the highest thermal efficiencies ever reached. With fuel consumption guaranteed as low as 8500 B.T.U./bhp/hr, it's *the same as buying your gas at lower rates!*

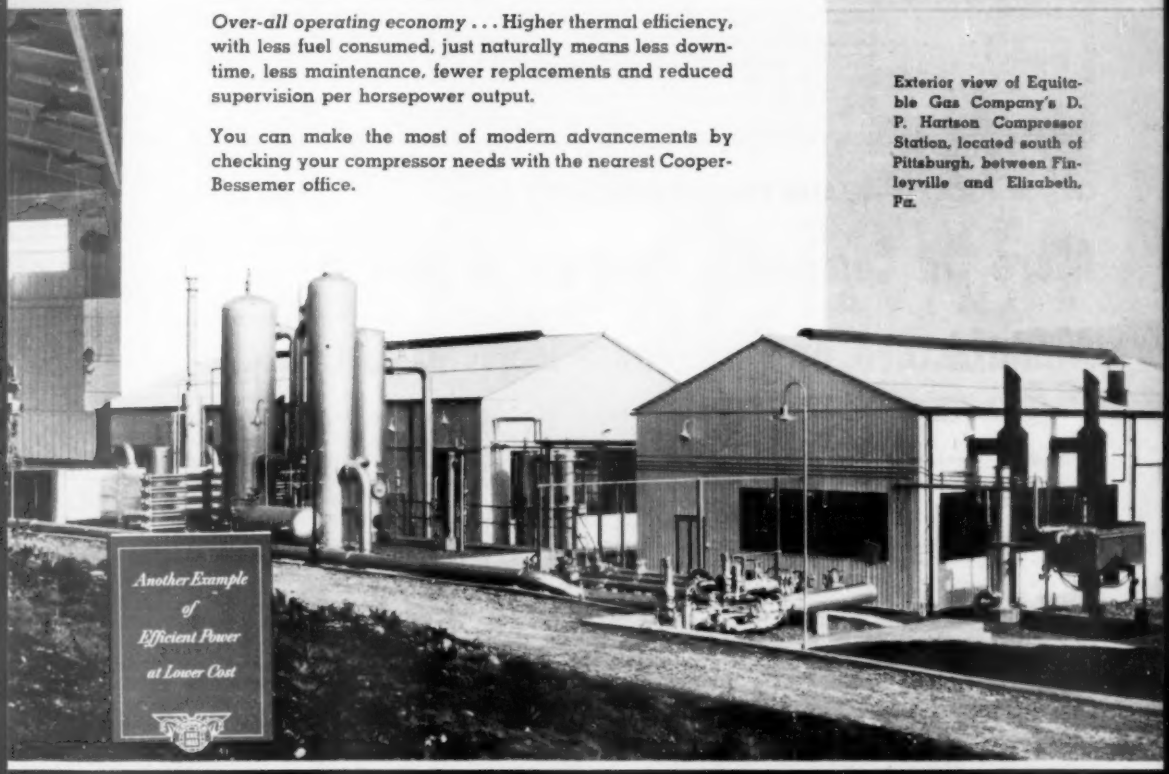
Space economy . . . To the inherent compactness of V-engine, V-angle design, add the fact that every crankthrow is available for driving a compressor cylinder. This, along with greatly increased horsepower output, means unmatched compressor capacity for your investment in space, foundation, piping and building.

Over-all operating economy . . . Higher thermal efficiency, with less fuel consumed, just naturally means less downtime, less maintenance, fewer replacements and reduced supervision per horsepower output.

You can make the most of modern advancements by checking your compressor needs with the nearest Cooper-Bessemer office.

Photo lower left Page:

Line-up of three 1100 hp Cooper-Bessemer GMV compressors at Equitable Gas Company's D. P. Hartson station. Note five compressor cylinders per engine, one for each GMV crankthrow. It was built by the Fluor Corporation. A similar station, Pratt, designed by Stone and Webster was built by Equitable; it has four type GMV-8's each rated 880 horsepower.



Exterior view of Equitable Gas Company's D. P. Hartson Compressor Station, located south of Pittsburgh, between Finleyville and Elizabeth, Pa.

by **Cooper-Bessemer**

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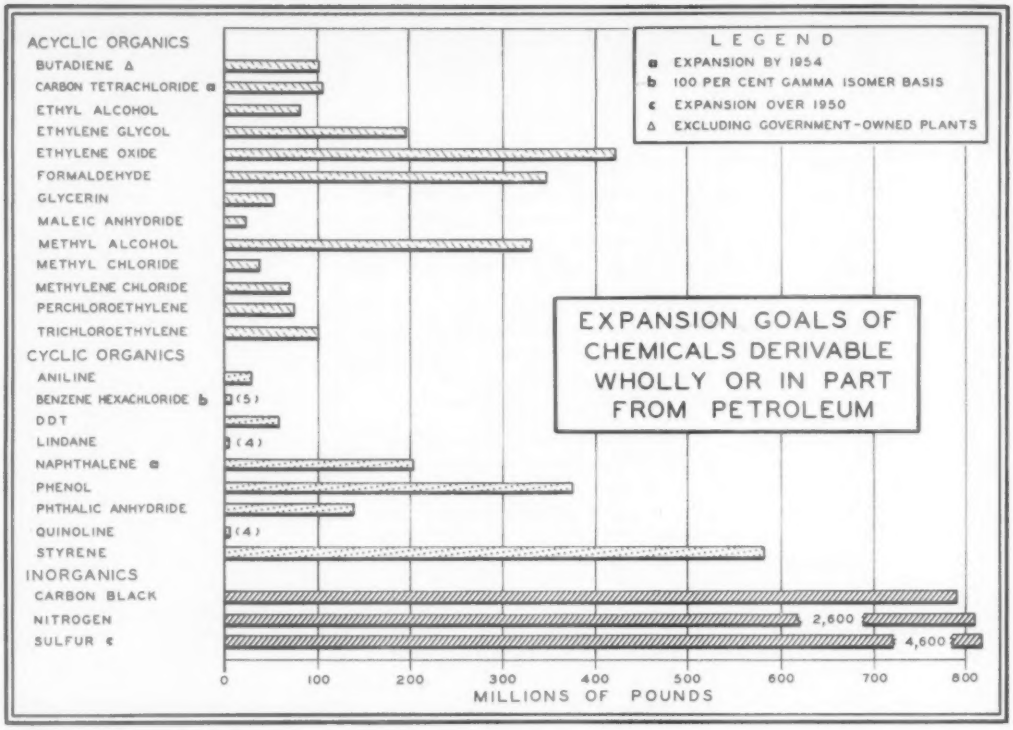

CERTAIN FORECAST—GREATER PETROCHEM PROGRESS

More Oil Companies Prepare to Join in Manufacture of Petroleum-Derived Chemicals

by George Weber

THE coming year will find many oil companies increasing their participation in the conversion of petroleum fractions to petrochemicals. The representation will broaden.

Many smaller companies will enter into new and expanded chemical operations. Those majors with extensive facilities in chemical divisions and subsidiary companies will share in plant expansion and diversification, and other large oil operators are planning important projects either independently or incorporation with firms outside the oil industry.

Nearly all of the larger integrated oil companies engage to some extent in petrochemical manufacture, and numerous small companies are now producing basic, intermediate, or finished chemicals from petroleum fractions.

Of the 19 largest integrated oil companies in this country, 5 have for several years maintained major wholly owned subsidiaries or divisions engaged in petrochemical manufacture. Last year, two more companies in this class organized new petrochemical companies. In addition, during 1952, three major oil companies and one natural-gas pipe-line company contracted with outside firms to form large petrochemical subsidiaries, bringing to five the number of these extensive joint ventures.

Despite this continuing interest on the part of the oil industry, petrochemicals in general are still dominated by pure chemical companies and other interests with no previous connection to oil. This group will continue dependent on oil refiners and gas producers for their raw materials, although there is a small movement on the part of some to secure their own future supplies in the form of producing properties and pipe lines.

That segment of the petrochemical industry represented by large oil companies is an aggressively expanding production of the major basic "building blocks," the large volume chemicals such as alcohols, aldehydes, ketones, glycols, etc., and a wide range of finished products in the detergent, resin, fertilizer, pesticide, lube-oil-additive, carbon-black, and synthetic-rubber fields.

The medium and small processor of oil and gas is finding most ready access to chemical manufacture through the

synthesis of aromatics, nitrogen products and tetramers, and the separation of sulfur, solvents, heavy resins and the low-molecular-weight basic hydrocarbons.

Aromatics Program

An outstanding example of oil company activity is the petroleum benzene program. Two years ago an acute shortage of this important basic resulted from its insufficient and erratic source of supply based on the coking of coal. The petroleum industry was tapped to alleviate the situation, and plentiful petroleum benzene, at a premium price, is now in prospect. Six months ago the Petroleum Administration for Defense announced that oil-industry plans for adding new aromatics production had exceeded the goals set up for meeting estimated civilian and defense needs.

In 1951 Defense Production Administration approved a program calling for construction of new facilities capable of producing 8,450 bbl. per day of petroleum benzene. Certificates of necessity were granted covering proposed construction of 8,505 bbl. per day of benzene capacity in 16 refineries and two plants processing natural-gas liquids. Of these projects, 15 representing 85 per cent of total capacity are now either completed or under construction.

The tentative schedule for new benzene facilities shows in daily productive capacity, about 2,350 bbl. now completed, 4,875 bbl. due for completion this year, with most of the remaining capacity due for initial operation next year. For the 18 plants to receive new benzene facilities, 10, representing 37.5 per cent of the total capacity, are operated by independent companies and the remaining 8 are operated by 5 major oil companies. As a result, petroleum benzene, which until recently was produced commercially by only two major refiners, will be available from a total of 15 companies. Reflecting their early adoption of catalytic reforming, the smaller refiners will account for a percentage of benzene production far greater than their relative crude capacity.

Benzene production is planned in most of the 30 refineries which have been granted necessity certificates under the general petroleum aromatics program. The program at this stage calls for the construction of capacity for producing about 9,500 bbl. per day of toluene. Of that total capacity, about 13 per cent is now in operation and 87 per cent will be on stream by the end of 1953 barring unforseen delays in construction schedules.

Produced with benzene and toluene are xylenes and an aromatic-rich mixture called aromatic base stocks. The latter will largely comprise blending stocks for aviation gasoline. Altogether, the aromatics program indicated by necessity certificates approved to date calls for the construction of facilities capable of producing nearly 29,000 bbl. per day of aromatic base stocks. These projects, most of which are not slated for benzene separation, are projected into the more distant future. Slightly over half the proposed capacity has not yet reached construction stage. Less than 10 per cent is now completed and only 30 per cent is slated for completion before this year's end. Some of the projects designed for producing high yields of these aromatic mixes are based on catalytic reforming units of major size.

While it may be assumed that the petroleum benzene situation is well in hand from the standpoint of approved construction, the goal in actual production will not be reached until 1954, or possibly later.

Petroleum benzene's place in the extended future is subject to question.

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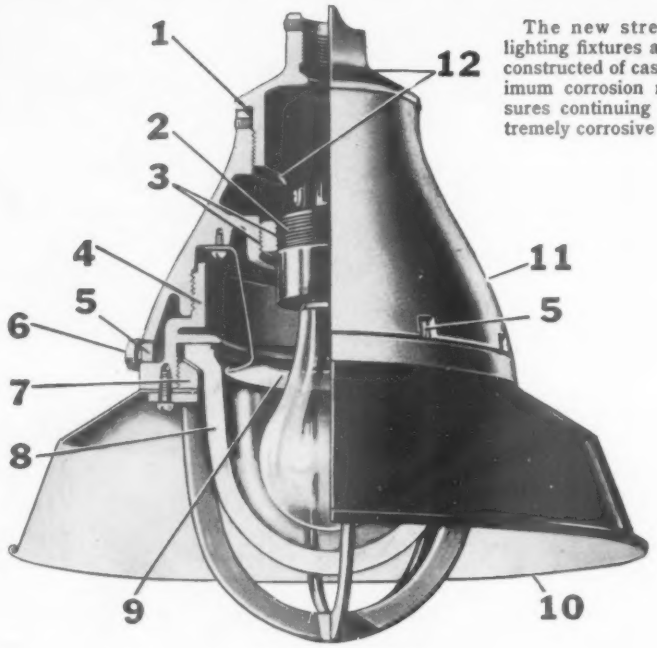

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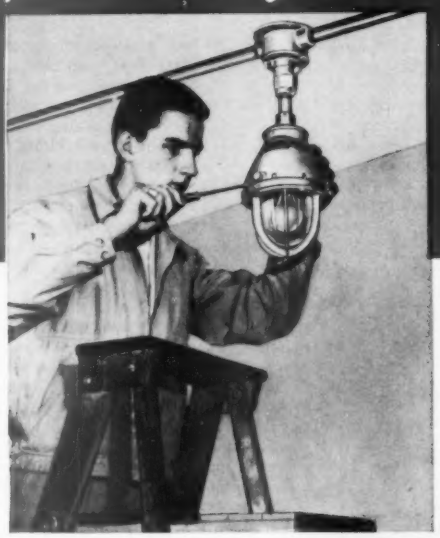

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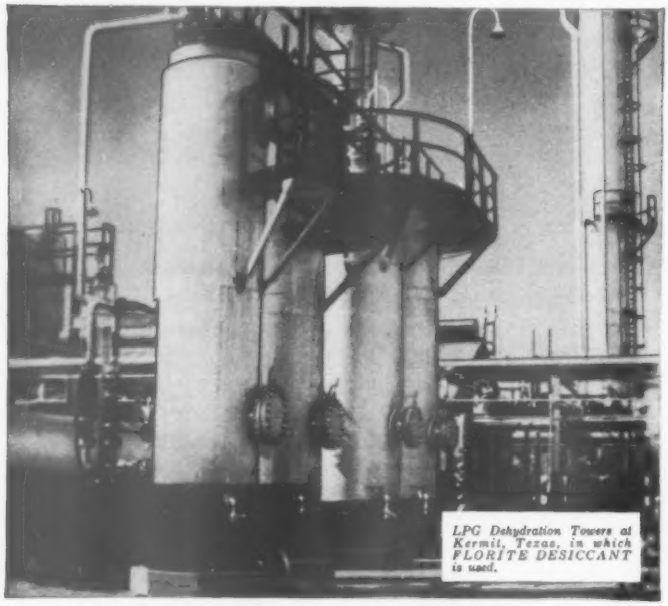
The going price for 1° benzene from petroleum is now 42 cents per gallon compared with 32 cents for comparable product from coke-oven sources. New developments announced last year in the hydrogenation of coal for direct chemical synthesis now lead some independent analysts to believe that in time, this new coal source may prove competitive with the petroleum-derived product. This possibility, however, is not expected to affect the economics of existing facilities since the basic catalytic reforming units necessary for petroleum benzene have a bright future in the production of high-octane blending stocks for motor and aviation gasolines.

The total aromatics program which the petroleum industry has undertaken will cost over $155,000,000, according to estimates on which certificates of necessity are based. This cost excludes some projects which were abandoned after receiving certification and some which are delayed. It also excludes aromatics projects not based on petroleum as a raw source.



LPG Dehydration Towers at Kermit, Texas, in which FLORITE DESICCANT is used.

FLORITE DESICCANT is the drying agent

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Sulfur

The past year brought some relief in the sulfur shortage and adequate supplies are now in prospect for the next few years. Although new capacity for producing elemental sulfur by the Frasch process from deposits along the Gulf Coast will add substantially to the supply, this country appears committed to partial dependence on recovery of sulfur and acid from alternate sources.

Petroleum sulfur, including recovery of the element from hydrogen sulfide present in natural and refinery gases, and reconstitution of acid sludge from refining operations, has already accounted for much of the additional supply, and will continue as an economic source in the future. For the present, the peak of construction of new recovery facilities of this type is past, but the oil industry will gradually augment the supply of this vital material by building more smaller plants in the future.

Petroleum Administration for Defense has recommended for accelerated amortization enough new projects to produce an estimated 422,000 long tons per year of sulfur or its equivalent in acid and other forms. Approved certificates show that of this total, roughly 21 per cent of capacity is based on the sulfur present in natural gas, and the remainder will come from refineries. It is granted that this overall program may be on the optimistic side, since many prospective operators with necessity certificates have not followed through with definite construction plans.

A survey recently undertaken by PAD shows that by 1955, 30 new plants completed or under way, and covered by necessity certificates will add about 276,000 long tons per year to capacity existing before accelerated amortization was granted. These are estimated to cost in excess of $20,000,000.

With few exceptions, sulfur-recovery projects now operating or committed, represent large units which show the greatest economic advantages. New plants of this size will continue to be built as additional concentrations of hydrogen sulfide are available from new sour-gas production, and as separation facilities are added to the larger refineries processing sulfur crudes. But the smaller recovery plant is entering the economic picture, and extensive reserves remain to be recovered in smaller increments after the major concentrated sources have been tapped.

A brisk competition has arisen among

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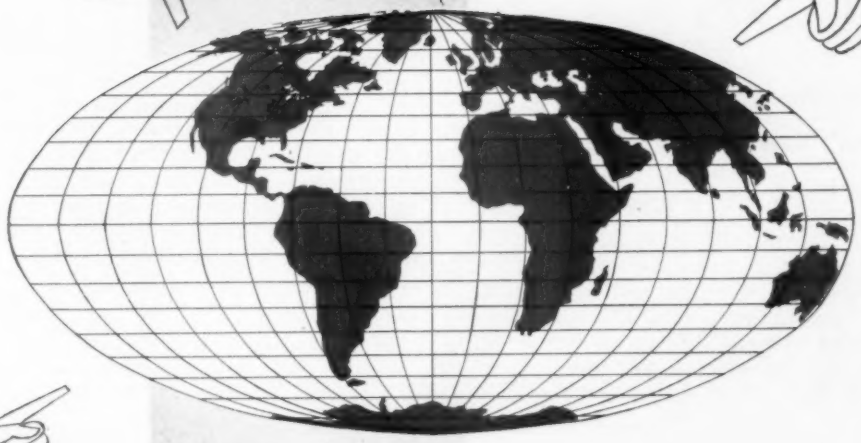

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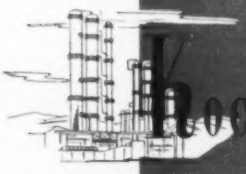

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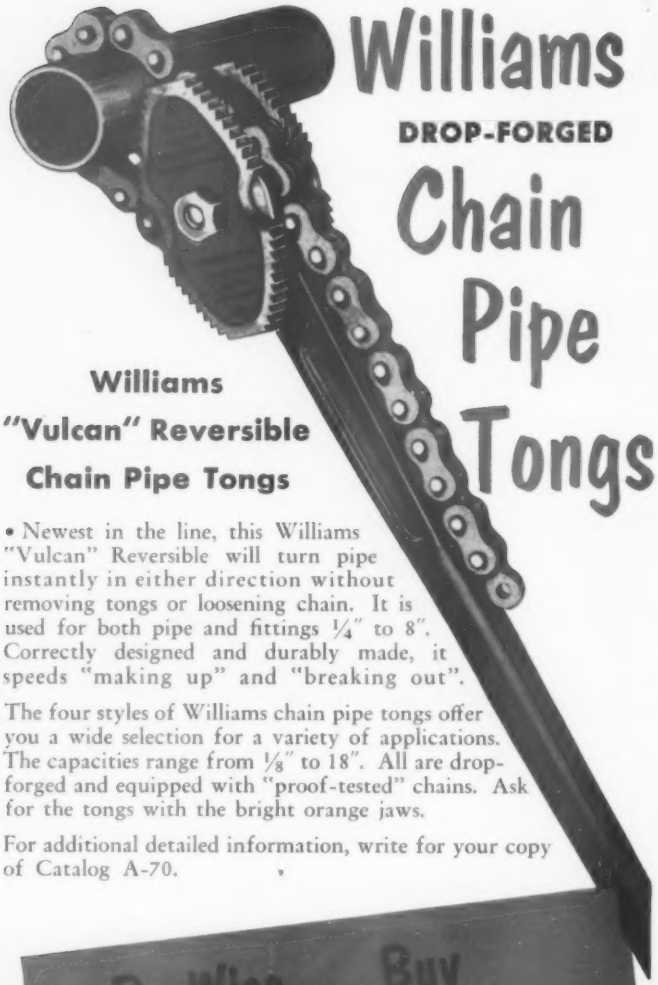

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designers and builders of sulfur-recovery units, and important improvements in efficiency have already resulted. This will in time extend the conservation of sulfur to sources not yet considered large enough to justify capital investment. In this class are hundreds of refineries and natural-gasoline plants which may equal or exceed the actual sulfur production available in the larger installations.

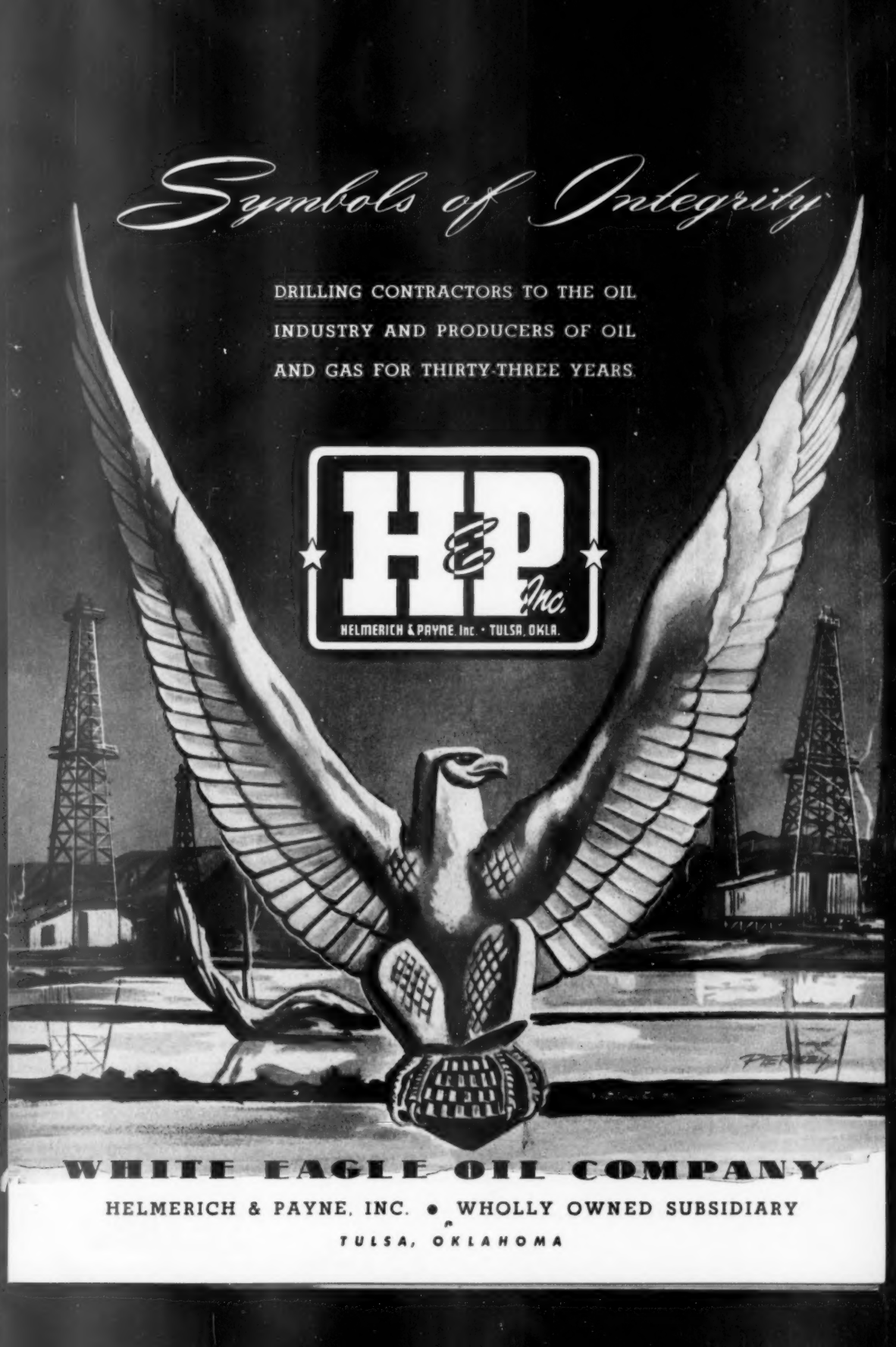
With the exception of some chemical and sulfur companies, oil companies themselves have integrated most petroleum sulfur-recovery projects with their own operations. It appears that refiners and natural-gasoline-plant operators, particularly the former, will continue to dominate the production of recovered sulfur in the future. Sulfur presents one of the most promising avenues of entry into petrochemicals for the medium or small refiner.

From the standpoint of tonnage, nitrogen products rank first in the list of petrochemicals. The record construction of postwar plants synthesizing ammonia and other nitrogen products from natural gas, plus the conversion of the largest existing plants from coke to natural gas has based the industry solidly on that raw source. Of the 1,621,000 tons of annual capacity (based on nitrogen) in operation a year ago, approximately 75 per cent was based on natural gas or was being converted to that hydrogen source.

Of the 29 projects covered with certificates of necessity, 22 involving over $340,000,000 will add about 1,087,000 tons of nitrogen per year in the form of ammonia. The seven remaining projects based primarily on electrolytic hydrogen, account for about $20,000,000 in new plant investment and will produce nearly 115,000 tons per year of equivalent nitrogen in the form of ammonia. Facilities for synthesizing other nitrogen products, also covered by amortization certificates, will cost $19,000,000 and will boost new production to roughly 1,280,000 tons of nitrogen per year. Nearly all of these projects are based on natural gas.

Completion of the current program will expand nitrogen production nearly 80 per cent to an annual capacity of 2,900,000 tons. Of this total, 82 per cent will operate on natural gas. Of the 2.7 million tons scheduled for completion by 1955, about 1.9 million will be used for agricultural uses, industry will absorb about 600,000 tons, and military and export requirements will consume 100,000 tons each.

While the petroleum industry has taken over the supplying of most of the raw material, the chemical industry still dominates the field of nitrogen product synthesis. Only seven oil companies are engaged in planning or con-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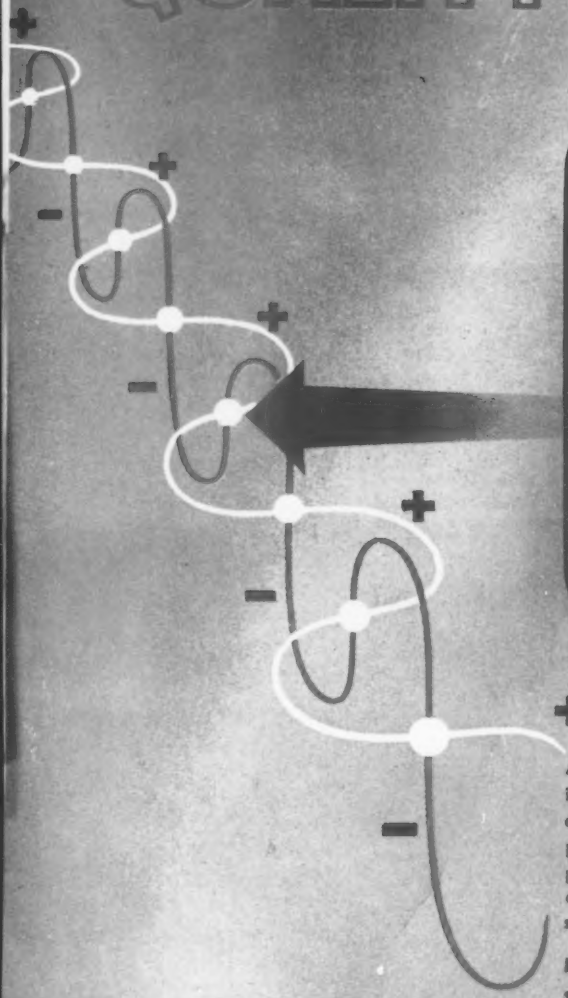

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structing new facilities. Although they are not restricted to major oil ownership, the plants in general entail a sizable capital investment, and it is not likely that oil and gas companies will substantially increase their participation in this phase of petrochemicals.

General Growth

The spectacular growth in petrochemicals is well illustrated by the accompanying chart prepared by W. E. Kuhn, manager of research for The Texas Co. The chart shows the production goals for 26 chemicals set by Defense Production Administration for January 1, 1955. The chemicals shown are derived from petroleum.

These selected chemicals, whose expansion is generally on schedule, indicate the extent to which the petrochemical industry is expanding. The end products represented by these chemicals are legion.

Beyond the projection of production goals such as those set by NPA, and the plotting of announced plant construction, it is hazardous to attempt to itemize future petrochemical growth. Market analysis even when restricted to a single product has become a highly complex occupation.

In general, plastics and resins will find a multitude of new uses and will continue to replace scarce metals such as copper and tin. Synthetics show every indication of continued growth at the expense of natural materials in the field of fibers. For the production of foods, this nation is very near the limit of tillable acreage. Greater yields per acre have resulted from the use of hybrid seed, which is now general. The next recourse for increasing per acre yields lies in the improved control of insects, weeds, and fungi, and the addition of plant foods to the soil. A firm growth in consumption of pesticides and fertilizers is projected for the extended future.

The petrochemical industry will share in the increased consumer demand of these three product classes, on the same basis which has spurred their phenomenal growth to date by providing needed products in sufficient volume at the right price. A plentiful and reliable basic supply gives petrochemicals an edge over many competitive chemical sources so long as the price is right.

Competition among processes will become keener this year. This competition exists both between petrochemical and other processes and between techniques based exclusively on petroleum-derived raw materials. Some of the products for which processing competition exists are: acetylene, acrylonitrile, ethyl alcohol, isopropyl alcohol, n-butyl alcohol, benzene, toluene, phenol, vinyl chloride, and phthalic anhydride.

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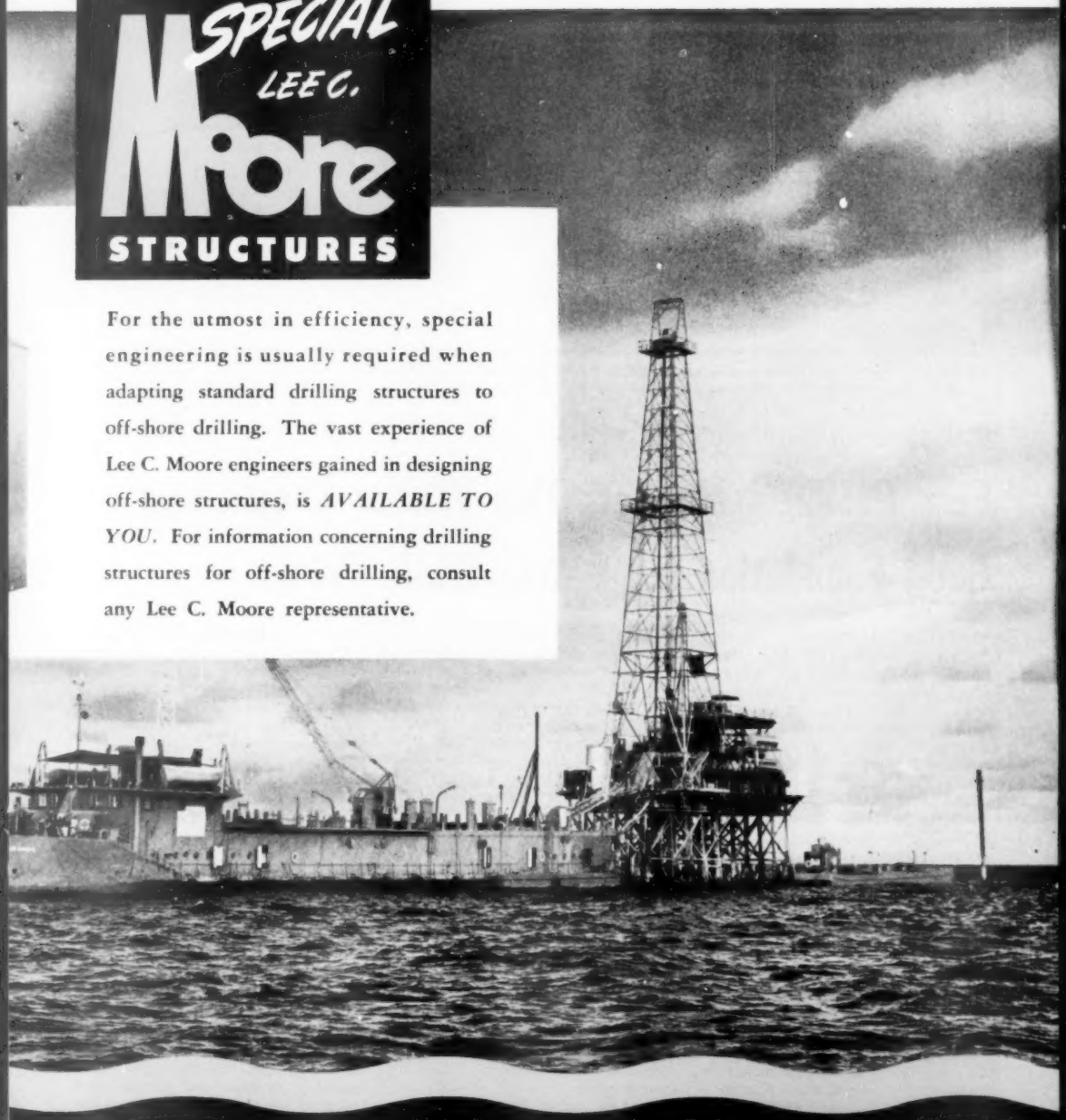

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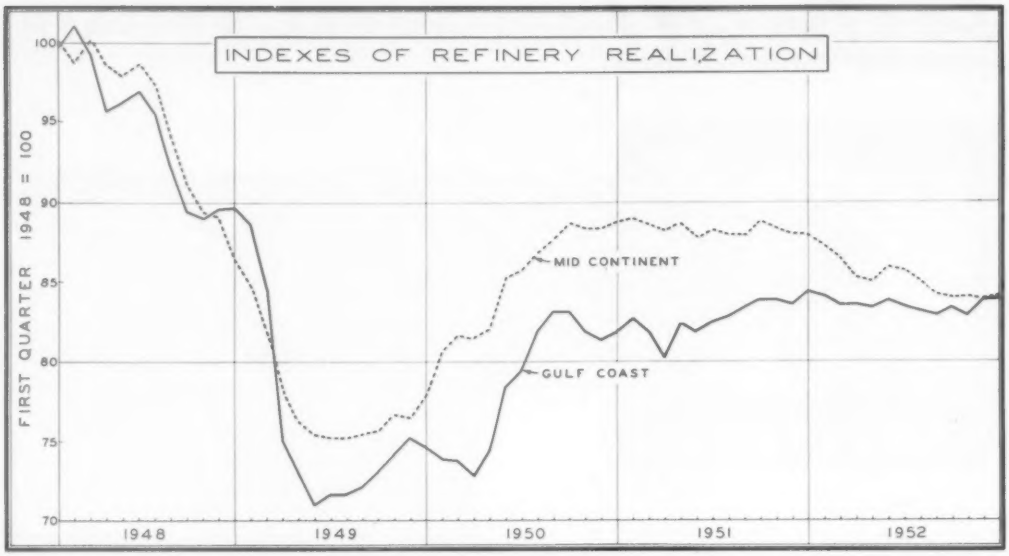

Refinery realization is the value at refinery of all products from a barrel of crude. Above realization data are based on average major product yields and average prices for refinery products as published in The Oil and Gas Journal.

NEAR SHORTAGE—OVERPRODUCTION

Firm Products Markets This Winter Would Lay Good Foundation for Better Crude Prices

PETROLEUM - PRODUCT markets in 1952 were highlighted by a near-shortage of light fuels on the East Coast, overproduction in the interior areas, a refinery strike, a pronounced drop in export sales of lube oils near the end of the year, and a decrease in gross refinery realization, particularly in the Mid-Continent area.

The near-shortage of distillate fuels and kerosine on the East Coast in the 1951-52 winter was due to the lack of balance between Gulf Coast and East Coast prices. Spot tanker rates for the movement of clean products from the Gulf Coast to points on the East Coast had moved up to 200 per cent over the Maritime Commission base by December 1951. For No. 2 fuel, this amounted to about 2.7 cents a gallon for transportation on any extra distillate that could not be moved in company-owned tankers or vessels under long-term charter.

Ceiling prices for No. 2 fuel in New York Harbor ranged from 9 cents a gallon to 9.25 for barge delivery with most of the larger suppliers having a price of 9 cents. A reasonably firm distillate market on the Gulf Coast meant that almost all of the No. 2 was selling for 8 cents. If a transportation cost of 2.7 cents, insurance cost of 0.1 cent, other costs for storing, handling, and financing, estimated at 0.45, are added to the Gulf Coast price, the supplier's actual cost of material delivered to a barge in New York Harbor was about 11.25 cents a gallon.

Definite Unbalance Shown

This figure represented actual costs for any No. 2 fuel that had to be moved at short-term tanker rates. That there was a definite unbalance between Gulf Coast and East Coast prices is shown by the calculated cost figure for distillate moved in tankers at Maritime Commission base plus 25 per cent which was the rate established for the military pool. This rate would produce a total cost for No. 2 in New York of about 9.68 cents a gallon compared with a ceiling of 9 cents for most suppliers.

Near the end of January, the Office of Price Administration rejected an increase of 0.5 cent, suggested by Petroleum Administration for Defense following a poll of most of the major suppliers, asking if they could boost shipments of home-heating oils if ceilings were raised 0.5 cent. Most of the companies had agreed to the proposal even though the increase would not cover the higher transportation costs.

The probable shortage on the East Coast was estimated by Petroleum Administration for Defense at about 3,000,000 bbl. Early in February, PAD was able to get a promise from most of the major suppliers to increase total home-heating-fuel deliveries to the East Coast even though the increase represented an actual operating loss of about $3,000,000.

With an increase in kerosine and distillate ceilings expected at any time, primary suppliers were not offering any material to customers other than regular accounts even after the winter peak was past. On the other hand, secondary suppliers and jobbers were trying to buy for storage before prices were advanced under the expected higher ceilings.

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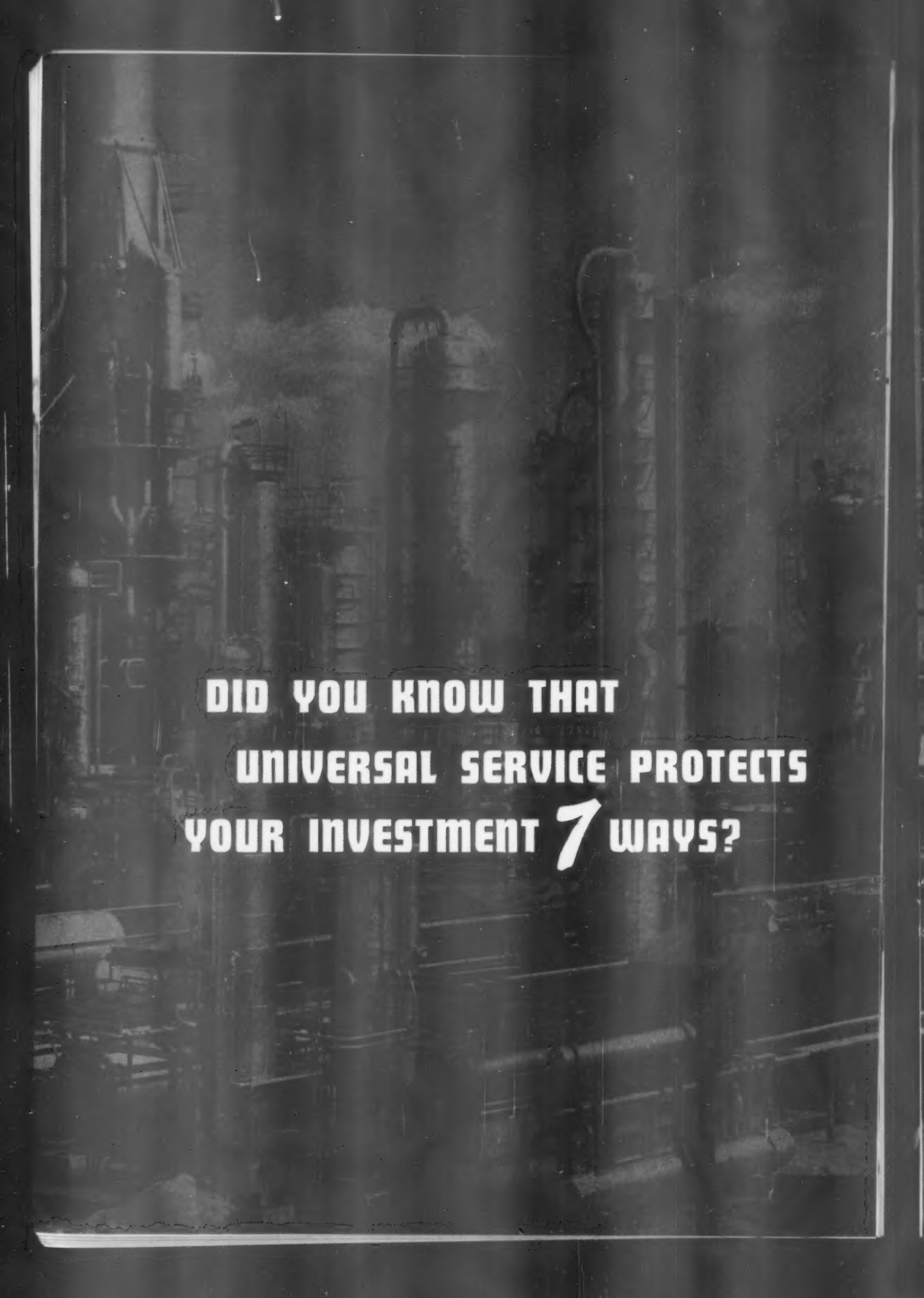
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New ceiling prices were finally approved and went into effect on June 30. They represented a gross increase of 0.8 cent a gallon with 0.15 cent reserved for the distributor. Primary suppliers were allowed an increase of 0.65 cent per gallon if they were selling at the low of the market.

In contrast with the near-shortage on the East Coast, most product markets in the Mid-Continent and North Central states were ranging from only slightly firm to soft.

By the middle of February, many refiners were trying to move distillate fuels to make room for increasing gasoline inventories. The threat of a refinery strike caused some suppliers to reduce their efforts to cut inventories by the end of the first quarter. When the strike truce was extended to about the middle of April, there was again some evidence of dumping in the distillate markets.

Mild Weather a Factor

Residual-fuel market in the interior states was soft even during the winter months. Milder weather plus larger gas supplies available for industrial accounts tended to cut the market for heavy fuel. Sales of residual for railway fuel had been declining for several years, and the further loss of industrial accounts to natural gas made the surplus large enough to break residual prices.

To protect prices on normal sales to accounts in the industrial areas on the North Central states, some Mid-Continent refiners moved heavy fuel to the Gulf Coast for shipment to the East Coast during the winter months when the demand for residual was good in the East. The netback to a Mid-Continent refiner was about $1.00 compared with a normal low of about $1.50 for product moving to northern markets.

Since the demand for residual on the Gulf Coast was very good both for export and for movement to the East Coast, some Mid-Continent refiners were able to make contracts that extended into the summer months. These contracts insured continued movement to the gulf and tended to postpone the actual break in the residual market. By the first of April, some distress material was moving to northern markets at $1.25 per barrel.

The strengthening effect of the refinery strike was followed by a loss in heavy-fuel consumption during the steel strike. As a result, residual prices dropped under $1.00 per barrel by the middle of July. Later in the year, some high-sulfur material was reported to have moved to resellers at $.70.

Before the refinery strike, gasoline was freely available in the Group 3

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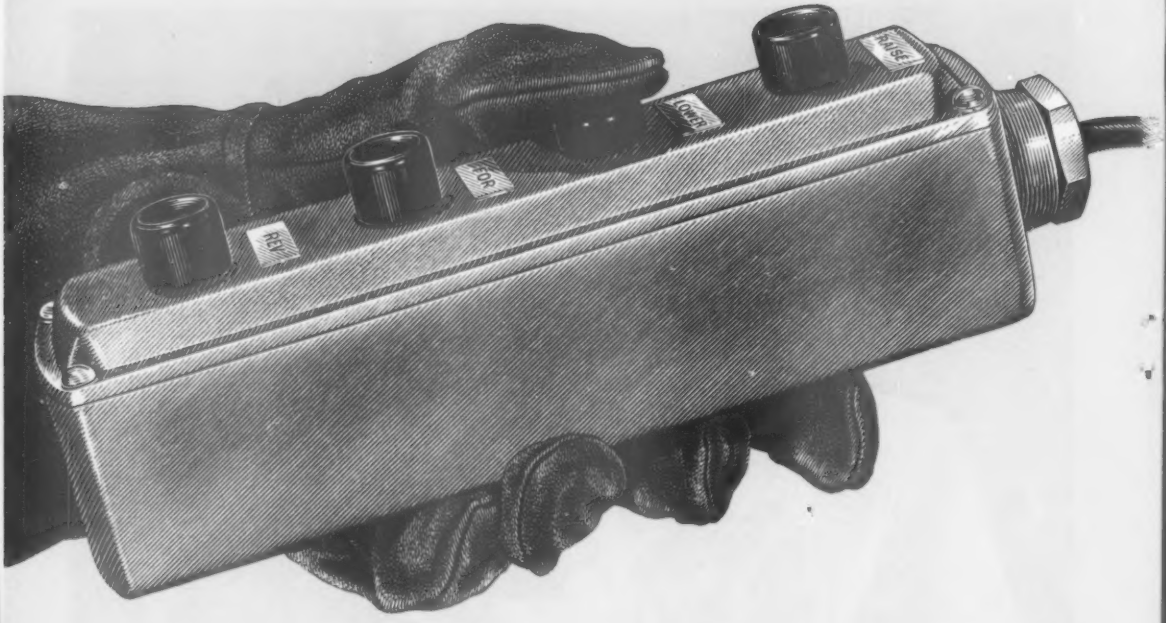

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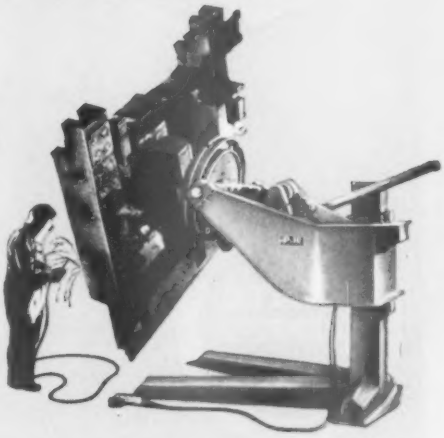

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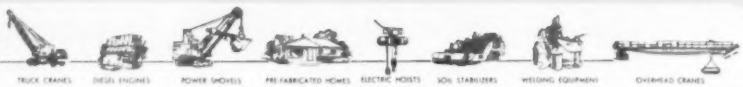

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"Continuing purchases by the armed forces on the West Coast have served to promote relatively firm product markets in that area."

area. Some material was offered on the pipe line at the Group 3 low plus 0.125 cent plus transportation compared with a normal of about Group 3 low plus 0.5 cent. This trend toward softness was due to excess inventories in the period just before the start of the peak gasoline season.

High refinery runs in the last half of the year prevented the normal firming of fuel markets in District 2 in the early winter months. All major products except gasoline were selling at less than ceiling prices at the end of the year.

The accompanying chart shows the effect of these under-the-ceiling prices on gross realization at Mid-Continent refineries. The general trend toward excess supplies restricted the increase in realization on the Gulf Coast, but there was a very definite drop in realization for the inland refineries.

Since 1948 refiners on the Gulf Coast as well as in the Mid-Continent have been squeezed between lower realization for products from a barrel of crude and higher operating costs.

Some slight trend toward softer product markets in almost all areas of the country in the early weeks of the second quarter indicated a general overproduction of most products. The refinery strike in May reduced product inventories and prevented any general break in prices.

District 2 Abnormalities

The only actual price increases that can be credited to the strike were in District 2 where some prices were subnormal. Even here, only gasoline and residual fuel responded to the reduction in current supply. For the country as a whole, the entire normal summer reduction in gasoline stocks came during the strike in May. This meant that refinery runs for the remaining summer months had to be high enough to supply peak summer demands for gasoline out of current production.

These high runs were continued even after the summer demands for gasoline had been met, and the accumulation of distillate stocks tended to prevent an early strengthening of the market for home-heating fuels.

Refinery runs averaged about 6,987,000 bbl. daily for the last half of the year with monthly averages above 7,000,000 bbl. daily in August, September, and November.

Distress selling of distillate fuels was reported in the Mid-Continent area as early as August. A few suppliers on the East Coast were caught with filled tanks and incoming contracted supplies in September. The result was some distress distillate on the market in that area. Major suppliers were looking for storage space.

A few of the East Coast residual suppliers who had restricted deliveries to regular customers in the 1951-52 winter announced that they would accept new accounts this winter. Also, some of the suppliers who were able to meet commitments last year only by purchases of heavy fuel in the Mid-Continent, expressed opinions that the normal sources of supply would be large enough to cover East Coast demand this winter. While some residual may move from Mid-Continent refineries to the Gulf Coast this winter, no one expects the ready market for residual that existed a year ago.

Military Purchases Boost Market

Continuing purchases by the armed forces on the West Coast have served to promote relatively firm product markets in that area. However, some of these purchases in recent months have been shifted to refineries in the Caribbean, and some of the refinery output has gone to rebuild inventories. If the request for higher ceilings on West Coast crude is approved, refiners will need higher ceilings on products.

Domestic demand for lubricants in the first 10 months of 1952 was 9.7 per cent less than in the same period of 1951. Also, in the last 4 months of the year export sales declined enough to increase the pressure on lube prices.

The construction of additional lube-oil capacity at European refineries has made it possible for these countries to decrease their imports of lubricating oils from the United States. Many lube-oil producers have predicted that lubricants will be very competitive in 1953.

The general trend toward softness in product markets has tended to reduce the possibility of a general increase in crude prices even if crude ceilings could be raised.

Independent refiners contend that they can not pay higher prices for crude unless they can get more for refined products. Firm product markets this winter and next summer would lay a good foundation for better crude prices.

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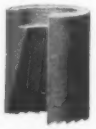

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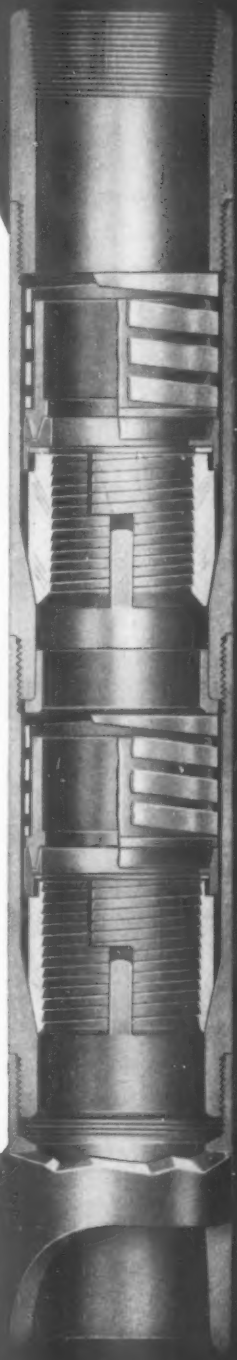

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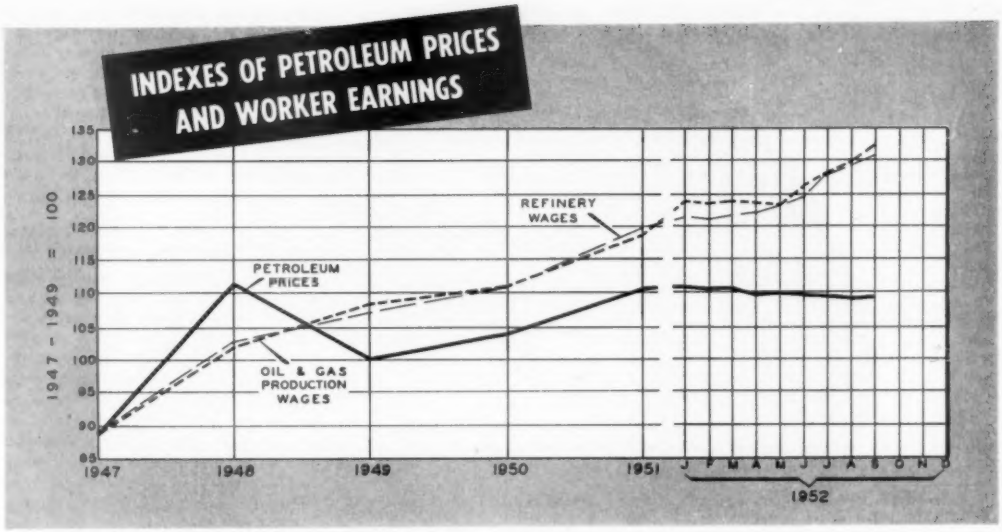

1953 WAGES—1948 PRICES

Costs Continue to Soar; Price Tags Unchanged

- Wholesale price index of petroleum and products lower than it was in 1948.
- Earnings of production workers have increased 69.3 cents per hour since 1947.
- Earnings of refinery workers have risen from a weekly $62.95 to $92.30 since 1947.

by Bertram F. Linz

THE multibillion-dollar giant that is the oil industry is suffering from atrophy of its financial sinews.

Over the past 5 years the prices of petroleum products have lagged behind those for other commodities—but costs of labor and materials have steadily increased.

Statistically, wages paid in the production and refining branches of the industry have increased more than 40 per cent since 1947. The price of steel has gone up to about the same extent. Other materials used by the industry have advanced correspondingly. Costs of transportation have risen particularly for rail movement.

But the wholesale price index of petroleum and products has risen only 22 per cent since 1947, and today it actually is lower than it was in 1948.

Only by continually increasing its volume of output has the industry been able to resist the effects of this malnutrition on the funds it must have to continue its constant discovery and development of new oil to meet the ever-increasing demand of the military and civilian consumers.

The story of what has happened in costs and prices since the war is told graphically in the figures gathered by the Bureau of Labor Statistics. They show what has been brought out above—that the labor cost of the oil industry has steadily increased while the increase in prices of its products has been much slower than that for industrial products as a whole.

Since 1947 the number of persons employed in the production branch of the industry has increased by 37,000, in the refining branch by 40,000. However, production requires one man in the rear for every man "on the front line" and the number of production workers in nonsupervisory jobs has increased only 16,000, from 120,000 in 1947 to 136,000 in 1952. In refining the ratio of nonproducers is less, and the number of production workers has increased 18,500, from 141,500 to 160,000. In both branches the ratio of scientific, technical, and management personnel to production workers is increasing, slowly in the production branch but rather rapidly in refining.

It is on the production workers that the Bureau of Labor Statistics bases its indexes of employment and earnings.

The figures show that average hourly earnings of production workers have increased 69.3 cents since 1947, from $1.473 to $2.166, and weekly earnings have increased $30.10, from $59.36 to $89.46.

In refining, average hourly earnings have increased 71.3 cents, from $1.566 to $2.279, and weekly earnings have

PRICE INDEXES

(1947-49 = 100)†

	Petroleum and products	Iron and steel	Farm products	All except farm products and foods
1947	88.2	89.7	100.0	95.3
1948	111.7	104.3	107.3	103.4
1949	100.1	106.0	92.8	101.3
1950:				
June (Pre-Korea)	103.1	113.1	94.5	102.2
Year	103.7	113.1	97.5	105.0
1951:				
January	109.9	124.5	112.3	116.6
Year	110.5	123.2	113.4	115.9
1952:				
January	110.8	123.1	110.0	114.3
February	110.4	123.2	107.8	114.2
March	110.6	123.2	108.2	113.8
April	109.5	123.0	108.7	113.3
May	109.9	122.8	107.9	113.0
June	109.6	122.4	107.2	112.6
July	109.4	122.3	110.2	112.5
August	108.3	127.2	109.9	113.0
September	108.5	127.5	106.6	113.2
October	108.5	127.3	104.9	113.0
November*	108.1	127.0	103.8	112.8

*Preliminary. †While the bureau does not report comparisons of current prices with those of 1926, it did calculate indexes on both bases for several years ending with 1951. These figures indicate that the index of prices in November, based on 1926 = 100, would place petroleum and petroleum products at about 117.5 compared with 174.0 for all commodities, 179.5 for farm products, and 191.6 for iron and steel.

OIL INDUSTRY EMPLOYMENT* AND WORKER EARNINGS

CRUDE AND NATURAL-GAS PRODUCTION

	Employment (thousands)	Weekly earnings (dollars)	Hours worked (weekly)	Hourly earnings (dollars)
1947	120.0	59.36	40.3	1.473
1948	127.1	66.68	40.0	1.667
1949	127.1	71.48	40.2	1.778
1950	125.7	73.69	40.6	1.815
1951	127.3	79.67	40.9	1.948
1952:				
January	127.3	84.53	41.7	2.027
February	127.5	82.29	40.8	2.017
March	128.3	84.57	41.6	2.033
April	129.2	83.10	41.1	2.022
May	128.7	81.93	40.6	2.018
June	134.0	85.53	41.3	2.071
July	136.1	85.85	41.0	2.094
August†	136.1	85.36	40.6	2.127
September†	136.0	89.46	41.3	2.166

REFINING

	Employment (thousands)	Weekly earnings (dollars)	Hours worked (weekly)	Hourly earnings (dollars)	All mfg. hourly earnings (dollars)
1947	141.5	62.95	40.2	1.566	1.237
1948	148.9	72.06	40.3	1.788	1.350
1949	148.8	75.33	40.2	1.874	1.401
1950	142.8	77.93	40.4	1.929	1.465
1951	151.9	84.70	40.7	2.081	1.594
1952:					
January	152.7	86.67	41.0	2.114	1.640
February	152.6	85.63	40.7	2.104	1.644
March	152.3	85.50	40.5	2.111	1.656
April	155.3	85.68	40.3	2.126	1.655
May	125.8	76.58	35.7	2.145	1.658
June	154.6	87.83	40.4	2.174	1.658
July	158.0	90.82	40.8	2.226	1.648
August†	160.5	90.28	40.0	2.257	1.670
September†	160.0	92.30	40.5	2.279	1.697

*Nonsupervisory production workers. †Preliminary.

risen $29.35, from $62.95 to $92.30.

Bureau records show that very few other occupations pay higher wages than the oil industry. Plasterers, electricians, and a few similar classes of workers do have higher hourly rates but this advantage is offset by loss of working time due to weather, fluctuations in demand for workers, and other reasons which do not apply in the oil industry.

Sidelight on Earnings

A little sidelight on earnings. The gross average weekly earnings of production workers in manufacturing was $49.97 in 1947 but in terms of 1939 dollars that was equivalent to only $31.12; in August 1952, the average was $67.80 but that was equivalent to only $35.27. After allowing for taxes, social security, etc., a worker with no dependents had $26.63 "spendable" earnings in 1947 in terms of 1939 dollars and last August had $28.88, or just $5.30 cents more than he had in 1939.

Bureau statistics on wholesale prices are in terms of "points" with the average for 1947-49 as 100. Prior to 1952, the bureau carried an index based on 1926.

In 1947 only the index for farm products stood at 100. The index for petroleum and products was 88.2, for iron and steel 89.7, and for all commodities other than farm products and food 95.3.

In June 1950, just prior to the invasion of Korea, the index for petroleum was 103.1, but for iron and steel it was 113.1 and for all commodities other than farm products and food it was 102.2. Only farm products were below the 1947-49 base, at 94.5.

When all prices were frozen by the Government in January 1951 the index for petroleum had risen only to 109.9 while that for iron and steel had jumped to 124.5 and for all commodities other than farm products and food, to 116.6. Farm products had made the greatest advance, to 112.3.

During 1952 farm prices tended downward and in November the index stood at 103.8. But the index for iron and steel, which had been given a price increase to compensate for higher wages, had risen to 127.0. Prices for most commodities had softened, however, as increased volumes became available for civilian consumption and the general index, covering everything except farm products and food, had declined to 112.8. Petroleum prices, too, had tended downward and the index figure was 108.1.

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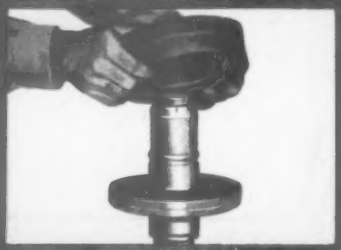

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UNDERGROUND STOCKPILE

Production and Proved Remaining Reserves—By Fields

On this and the following several pages are estimates of proved remaining reserves of crude oil, condensate, and cycled products for the country's larger producing fields. Fields with an estimated ultimate recovery of 100 million barrels or more are marked by asterisks.

PRODUCTION AND RESERVES—ARKANSAS

(In thousands of barrels)

	1952 production	January 1, 1953 Cumulative	January 1, 1953 Estimated reserves	January 1, 1953 No. of wells
Atlanta	815	14,514	10,486	47
Buckner	729	10,459	7,541	51
Cairo	602	2,657	5,343	17
Dorcheat-Macedonia	867	15,848	9,152	90
El Dorado, East	532	11,286	3,714	131
Fouke	1,034	9,355	6,645	72
*Magnolia	4,215	72,556	47,444	114
McKamie	1,400	13,287	16,713	32
Midway	2,662	27,423	22,577	46
*Schuler	1,880	69,244	30,756	93
Schuler, East	452	1,847	3,153	27
*Smackover	3,842	434,440	45,560	1,497
Stephens	1,320	23,593	12,407	431
Urbana	684	11,798	6,202	258
Village	1,015	14,282	11,718	84
Wesson	3,515	19,135	20,865	163

PRODUCTION AND RESERVES—CALIFORNIA

(In thousands of barrels)

SAN JOAQUIN VALLEY

	1952 production	January 1, 1953 Cumulative	January 1, 1953 Estimated reserves	January 1, 1953 No. of wells
Antelope Hills	398	5,348	4,652	37
Antelope Hills, North	555	932	5,068	21
Belgian Anticline	1,826	4,109	15,891	47
Belridge, North	601	61,269	8,731	60
Belridge, South	2,644	53,187	31,813	707
*Buena Vista	9,747	422,861	127,139	980
Canal	492	16,293	6,707	29
*Coalinga, Eastside	5,706	287,124	62,876	837
Coalinga, Northeast	666	33,945	11,055	37
*Coalinga, Nose	16,776	200,751	179,249	110
*Coalinga, Westside	2,365	171,211	28,789	792
*Coles Levee, North	5,934	67,445	82,555	138
Coles Levee, South	2,021	23,919	37,476	39
*Cuyama, South	13,989	37,748	122,252	236
Cymric	2,014	26,850	28,150	223
Edison	5,471	45,373	44,627	479
*Elk Hills	2,828	210,112	439,888	†170
Fruitvale	3,370	55,015	34,985	292
Gosford, East	797	2,623	7,377	25
*Greeley	4,741	55,568	44,432	83
Guijarral Hills	3,190	16,104	33,896	66
Helm	873	9,747	10,253	50
Jacalitos	903	14,183	15,817	106
Kern Bluff	405	2,821	6,179	118
*Kern Front	2,748	79,206	30,794	681
*Kern River	4,648	318,702	51,298	2,770
*Kettleman North Dome	7,992	389,465	90,535	322
Lost Hills	2,166	71,136	23,864	651
*McKittrick	986	98,514	11,486	227
McKittrick Front	588	8,374	6,626	73
*Midway-Sunset	12,277	773,036	146,964	3,090
*Mount Poso	2,792	105,813	34,187	397
Mountain View	1,314	55,343	19,657	181
Paloma	3,502	39,498	70,534	82
Pleasant Valley	720	10,354	9,646	19
Premier	1,357	16,394	13,606	218
Race Track Hill	592	4,615	10,385	55
Raisin City	1,791	12,399	12,601	91
*Rio Bravo	4,343	63,755	51,245	93
Riverdale	803	11,284	8,716	42
Round Mountain	1,244	41,370	18,630	182
Russell Ranch	5,867	28,663	51,337	151

SAN JOAQUIN VALLEY (Continued)

	1952 production	January 1, 1953 Cumulative	January 1, 1953 Estimated reserves	January 1, 1953 No. of wells
Salt Creek	1,637	10,804	19,196	64
Tejon Hills	1,620	3,838	11,162	187
Tejon Ranch	756	6,286	8,714	106
Ten Section	1,626	52,067	22,933	114
Wheeler Ridge	387	5,809	6,191	62

†Does not include 656 "mothballed" oil wells.

COASTAL REGION

Aliso Canyon	2,428	16,135	23,865	84
Bardsdale	644	5,268	4,732	88
Capitan	574	15,452	6,548	70
Castaic Junction	521	825	5,175	12
*Cat Canyon, West	6,609	58,698	66,302	242
Del Valle	1,225	16,107	13,893	80
*Elwood	1,785	91,685	13,315	64
Gato Ridge	1,078	19,682	10,318	44
Guadalupe	439	619	14,381	31
Honor Rancho	2,277	2,621	27,379	55
Lompoc	1,919	22,417	17,583	100
Newhall-Potrero	2,834	28,616	31,384	86
Oak Canyon	509	5,930	6,070	20
*Orcutt	1,415	113,461	16,539	265
Oxnard	633	4,388	5,612	15
Placerita Canyon	3,471	18,455	31,545	336
Ramona	1,299	10,686	14,314	121
Rincon	3,055	46,077	38,923	198
*San Ardo	8,275	11,781	88,219	352
San Miguelito	4,260	31,954	43,046	100
*Santa Maria Valley	4,011	110,078	49,922	432
South Mountain	2,835	39,990	30,010	263
*Ventura Avenue	27,217	448,110	226,890	850
Zaca Creek	1,571	5,411	14,589	36

LOS ANGELES BASIN

*Brea-Olinda	6,926	220,042	79,958	498
*Coyote, East	2,734	65,118	34,882	247
*Coyote, West	3,339	175,822	64,178	329
*Dominguez	3,892	195,631	49,369	345
East Los Angeles	343	2,817	4,183	18
*Huntington Beach	21,815	502,746	197,254	1,420
*Inglewood	4,966	184,755	55,245	428
*Long Beach	7,959	766,343	83,657	1,140
*Montebello	1,925	159,458	25,542	336
Newport, West	1,501	14,565	20,435	206
Playa del Rey	588	56,246	5,754	103
*Richfield	2,413	119,167	20,833	373
Rosecrans-Athens	1,701	70,188	19,812	223
Sansinena	1,893	3,672	16,328	57
*Santa Fe Springs	5,198	543,844	56,156	545
*Seal Beach	4,090	130,722	44,278	230
*Torrance	2,506	135,789	29,211	767
*Wilmington	48,073	605,952	394,048	2,460

PRODUCTION AND RESERVES—TRI-STATE AREA

(In thousands of barrels)

ILLINOIS

Albion	1,134	11,771	6,229	335
Assumption, North	494	3,613	4,387	131
Benton	3,056	26,547	13,453	237
Boyd	557	8,714	6,286	109
*Bridgeport	1,996	248,321	36,679	3,569
Bungay	608	6,721	3,279	164

ILLINOIS (Continued)

	1952 production	January 1, 1953 Cumulative	Estimated reserves	No. of wells
Centralia	836	37,136	7,864	559
*Clay City	6,993	147,453	37,547	2,571
Cordes	773	5,742	4,258	130
Dale	2,249	45,434	19,566	793
Golden Gate	499	5,346	4,654	147
Inman, East	630	9,869	2,131	321
Inman, West	386	2,285	2,715	167
Johnsonville	678	27,439	6,561	347
*Loudon	5,587	168,689	106,311	2,073
Marine	674	8,007	3,993	147
Mattoon	384	10,350	2,650	409
New Harmony	3,215	69,958	20,042	1,579
Parkersburg	452	7,568	2,432	176
Phillipstown	1,084	12,341	7,659	337
*Robinson	1,572	161,641	28,359	6,687
Roland	554	11,232	2,768	218
St. James	412	12,207	3,793	163
Sailor Springs	1,204	20,279	9,721	607
*Salem	3,080	222,438	57,562	2,188
Woodlawn	376	12,794	3,206	148
INDIANA				
Carbon	753	3,014	1,986	101
Griffin	1,147	32,934	9,066	544
Mount Vernon	422	5,290	2,710	88
Rochester	1,149	3,435	4,565	37
Union-Bowman	560	2,587	9,413	336
KENTUCKY				
Hitesville, South	521	6,852	4,148	171
Morganfield, South	550	3,234	3,766	133
Poole	1,544	9,216	6,784	324
Pratt	522	1,422	3,578	43
Uniontown	527	12,834	5,166	250

PRODUCTION AND RESERVES—KANSAS

(In thousands of barrels)

Barry	727	6,056	7,944	68
Bartholomew	467	1,435	3,565	68
*Bemis-Shutts	3,741	72,052	32,948	563
Blankenship	621	6,027	1,973	98
Bloomer	2,344	40,872	24,128	295
Bornholt	369	13,815	4,185	141
Boyd	795	5,025	4,975	114
Burnett	2,709	42,909	27,091	298
Burnett, Southwest	484	3,388	4,612	80
Burrton-Haury	909	47,392	7,608	332
Chance	652	1,514	5,486	70
*Chase-Silica	7,152	169,120	70,880	1,396
Chitwood	514	6,943	5,057	74
Cooper	1,089	2,063	7,937	81
Drach	395	5,206	4,794	55
Edwards	1,173	14,670	9,330	148
Elbing	579	23,150	6,850	84
*El Dorado	3,454	211,428	43,572	1,853
Fairport	879	24,220	10,780	197
Ft. Zarah	962	1,292	3,708	105
Geneseo	2,131	32,319	17,681	245
Gorham	1,990	53,994	18,006	456
Graber	812	10,746	4,254	112
Hall-Gurney	3,954	54,943	40,057	1,028
Huffstutter	642	2,245	5,755	134
Iuka-Carmi	1,244	12,440	12,560	187
Jelinek	594	2,173	4,827	68
*Kraft-Prusa	5,449	61,173	58,827	716
Lindsborg	508	6,799	5,201	104
Marcotte	1,964	5,916	6,084	209
Max	691	5,009	4,991	77
Morel	2,092	14,853	21,147	207
Otis-Albert	447	9,093	5,907	140
Ray	1,624	14,601	15,399	152
Richardson	571	11,807	5,193	67
Ritz-Canton	444	42,634	4,366	178
Russell	499	9,751	3,249	94
Seeley-Wick	1,292	18,815	13,185	325
Smolan	778	1,119	3,881	90
Smyres	380	2,462	2,538	49
Solomon	523	957	4,043	65
Stoltenberg	1,471	34,845	15,155	364
Thrall-Agard	1,650	27,006	12,994	263
*Trapp	6,469	137,286	72,714	1,354
Welch	371	6,257	3,743	87
Zenith-Peace Creek	449	37,977	12,023	213
Eastern Kansas stripper	4,414	185,231	59,769	8,019

PRODUCTION AND RESERVES—LOUISIANA

(In thousands of barrels)

NORTH LOUISIANA

	1952 production	January 1, 1953 Cumulative	Estimated reserves	No. of wells
Ada	472	889	5,111	44
Benton	1,154	6,891	9,109	13
*Caddo	5,142	199,879	55,121	3,208
Catahoula Lake	434	2,198	3,802	18
Catahoula Lake, West	601	2,134	5,866	40
*Cotton Valley	3,115	70,252	29,748	187
*Delhi-Big Creek	7,815	61,337	113,663	395
DeSoto	652	62,941	12,059	160
*Haynesville†	3,383	118,489	31,511	415
Haynesville, East	1,949	6,560	16,440	99
Holly Ridge	565	8,632	6,368	42
Homer	787	81,484	10,516	325
Knowles	1,124	5,102	9,898	33
*Lake St. John	5,938	49,987	60,013	146
Lisbon	1,998	25,479	26,521	306
Nebo	2,127	31,219	28,781	165
Olla	1,754	33,891	21,109	161
Ora	445	7,735	4,265	214
*Rodessa‡	1,642	168,751	16,249	479
Ruston	522	1,432	6,568	19
Saline Lake	563	2,221	4,779	21
Shongaloo, North	405	1,050	3,950	23
Sligo	884	8,517	6,483	76
Spring Hill†	591	591	4,409	39
Urania	805	34,430	7,570	252
Waskom-Greenwood	607	1,659	4,341	66

†Includes Arkansas portion of field. ‡Includes Arkansas and Texas portions of field.

SOUTH LOUISIANA

Anse la Butte	2,386	28,968	21,032	88
Avery Island	3,076	17,750	27,250	41
Avondale	682	1,790	8,210	15
Bancroft	1,686	8,862	16,138	34
Barataria	1,609	17,847	17,153	26
Barataria, West	1,262	7,986	12,014	20
Bateman Lake	1,015	8,141	11,859	16
Bay de Chene	1,301	4,425	13,575	22
Bay St. Elaine	2,733	13,735	26,265	52
Bay Marchand	2,005	6,825	21,175	27
Bayou Blue	1,230	10,017	9,983	73
Bayou Choctaw	644	6,152	5,848	26
Bayou Couba	734	3,076	6,924	21
Bayou de Fleur	539	2,789	5,211	7
Bayou des Allemands	911	3,238	9,762	30
Bayou Mallet	1,541	6,330	13,670	61
Bayou Perot	527	3,692	5,308	9
Bayou Sale	5,173	42,192	49,808	76
Big Island	865	3,185	8,815	33
Black Bayou	819	18,053	7,947	28
Bosco	694	32,403	7,597	38
Bully Camp	1,236	3,993	12,007	20
*Caillou Island	7,137	70,838	64,162	123
Cankton, North	917	5,536	9,464	33
Chacahoula	847	9,539	8,461	33
Charenton	1,174	22,326	12,674	109
Cox Bay	2,042	3,251	14,749	43
Crowley, North	1,363	22,847	15,153	44
David Haas	1,123	5,102	10,898	20
Delacroix Island	781	4,814	7,186	20
Delta Duck Club	932	5,230	9,770	18
*Delta Farms	6,751	53,164	51,836	111
DeQuincy	719	1,932	8,068	21
Dog Lake	1,206	9,893	12,107	33
Duck Lake	2,238	3,982	16,018	47
Egan	1,869	14,890	21,110	73
Eola	478	27,959	4,041	49
*Erath	5,192	51,814	73,186	75
Eugene Island	611	1,309	16,691	5
Fordoche	1,061	2,930	9,070	34
Garden Island Bay	1,597	19,870	15,130	55
Gibson and East	1,538	29,110	12,890	36
Golden Meadow	4,463	50,096	44,904	232
Good Hope	2,289	16,212	21,788	35
Grand Bay	3,678	39,085	35,915	82
Grand Lake	677	11,246	4,754	22
Gueydan and West	2,014	30,768	19,232	78
Hackberry, East	1,057	45,757	10,243	57
Hackberry, West	2,732	35,197	26,803	76
Horseshoe Bayou	1,298	10,041	14,959	18
Hurricane Creek	562	2,744	6,256	27
*Iowa	2,464	73,164	26,836	88
Jeanerette, South	900	3,486	8,514	19
*Jennings	865	103,741	16,259	88
*Lafitte	4,465	74,466	50,534	79
Lake Chicot	1,102	10,158	11,842	26

SOUTH LOUISIANA (Continued)

	1952 production	January 1, 1953 Cumulative	Estimated reserves	No. of wells
Lake Mongoulois	1,004	4,551	10,449	16
Lake Pelto	2,401	16,526	21,474	43
Lake Salvador	1,856	18,211	19,789	28
La Pice	856	7,608	7,392	23
Leeville	2,416	41,812	22,188	100
Main Pass-Block 69	1,900	5,609	22,391	17
New Iberia	1,258	43,910	14,090	54
Paradis	3,394	41,264	38,736	80
Pine Prairie	996	15,811	10,189	64
Pointe-a-la-Hache	2,766	7,174	24,826	64
Port Barre	1,245	24,208	13,792	68
Quarantine Bay	3,476	40,457	37,543	67
Romere Pass	3,589	6,490	33,501	48
St. Gabriel	2,081	19,798	20,202	48
Section 28 Dome	1,336	6,266	13,734	43
Sulphur Mines	722	24,026	6,974	61
Sunshine	988	3,182	10,818	20
Tepetate	512	18,621	5,379	55
Tepetate, North	932	6,933	10,067	55
Tepetate, South	1,272	13,983	14,017	33
University	1,837	34,892	20,108	58
*Venice	5,933	45,443	59,557	87
Ville Platte	1,420	50,889	11,111	224
*Vinton	3,753	74,838	40,162	130
*Weeks Island	10,705	29,327	95,673	91
West Bay	3,087	20,069	29,931	55
West Cote Blanche Bay	2,810	16,849	25,151	52
West Lake Verret	1,964	13,808	18,192	46
White Castle	1,576	20,474	15,526	35
White Lake, East	1,426	11,657	16,343	26

PRODUCTION AND RESERVES—MICHIGAN

(In thousands of barrels)

Beaver Creek	507	3,224	2,776	93
Coldwater	1,393	12,766	10,234	69
Deep River	1,847	18,711	21,289	93
Kawkawlin	561	7,686	4,314	292
Kimball Lake	413	5,429	4,571	63
Norwich, East	473	3,282	3,718	84
Pentwater	668	4,519	5,481	135
Porter-Yost	328	45,397	4,603	260
Reed City	536	38,867	6,133	168
Rose City	580	1,087	4,913	73
St. Helen	426	1,778	4,222	84
Stony Lake	725	4,735	4,265	75

PRODUCTION AND RESERVES—MISSISSIPPI

(In thousands of barrels)

Baxterville	6,242	33,860	61,140	173
Brookhaven	4,088	29,543	35,457	89
*Cranfield	3,711	40,738	59,262	70
Eucutta	1,692	17,448	17,552	125
Gwinville	486	2,721	4,279	80
*Heidelberg	3,434	31,775	78,225	171
Kingston and North	766	1,185	6,815	20
La Grange	3,278	19,793	30,207	140
Mallalieu	1,987	21,890	20,110	69
Pickens	763	14,935	10,065	37
*Tinsley	4,961	127,763	52,237	297
Yellow Creek	1,628	6,563	14,437	120

ALABAMA

Gilbertown and East	736	4,335	5,665	65

PRODUCTION AND RESERVES—NEW MEXICO

(In thousands of barrels)

Arrowhead	809	18,671	11,329	117
Bagley	2,447	4,798	25,202	38
Bough	770	1,750	8,250	15
Brunson	3,511	15,980	34,020	138
Cooper-Jal	1,280	30,103	14,897	148
Crossroads	939	2,366	9,634	13
*Denton	4,329	5,653	104,347	72
Dollarhide, West	753	788	10,212	21
Drinkard	4,007	31,835	43,165	448
*Eunice-Monument	9,588	226,314	133,686	968
Gladiola	780	1,088	10,912	15
Grayburg-Jackson	1,353	28,269	16,731	372
Hare	2,027	4,908	20,092	78
*Hobbs	3,902	139,525	50,475	262
Langlie-Mattix	1,635	29,621	17,379	470
Lovington and East	1,136	7,651	12,349	82
Maljamar	1,813	25,044	24,956	275
Paddock	887	8,589	9,411	102
Saunders and South	1,571	1,616	23,384	39
*Vacuum	4,496	62,077	62,923	428

PRODUCTION AND RESERVES—OKLAHOMA

(In thousands of barrels)

	1952 production	January 1, 1953 Cumulative	Estimated reserves	No. of wells
Allen (Deep)	1,336	65,132	14,868	351
Apache	1,331	20,332	11,668	42
Arno, West	406	1,067	3,933	45
*Avant	430	100,998	9,002	596
Bebee	1,244	25,615	9,385	467
Blackwell	380	7,100	2,900	80
*Bowlegs	1,003	133,700	16,300	179
Brock, West	679	4,394	3,606	99
*Burbank	3,157	236,001	93,999	1,690
Burbank, South	617	48,572	11,428	244
Cache Creek	1,042	10,582	9,418	291
Camp	975	2,291	7,709	58
*Cement	3,964	68,201	41,799	717
Ceres, South	464	3,812	4,188	116
Chitwood	729	3,442	4,558	19
Coon Creek	1,113	9,452	8,548	40
Coyle, Southeast	626	725	5,275	19
Cromwell	537	64,497	7,503	196
Cumberland	3,102	43,335	31,665	143
*Cushing	2,889	390,900	59,100	1,641
Davenport, West	948	2,074	5,926	94
Doyle	2,475	6,840	9,160	149
*Earlsboro	423	133,113	6,887	115
Edmond	383	24,608	3,392	65
Edmond, East	506	4,507	5,493	112
*Edmond, West	4,471	99,985	40,015	710
*Elk City	7,248	20,606	99,392	261
Empire-Comanche	493	31,419	5,581	399
Eola	1,178	3,475	4,525	17
*Fitts	909	110,069	14,931	451
*Fox-Graham	5,532	54,987	55,013	637
Garber	396	60,758	4,242	409
*Glennpool	2,252	245,837	29,163	1,715
*Golden Trend	14,213	78,889	121,111	1,197
Happy Valley	608	2,499	3,501	89
*Healdton	2,183	217,779	32,221	1,990
*Hewitt	3,173	120,925	29,075	1,149
Hoover, Northwest	693	4,971	5,029	174
Knox	1,637	26,946	15,054	354
Lauderdale	377	15,989	4,011	155
*Little River	852	125,829	9,171	173
Lone Grove, Southwest	709	9,043	5,957	131
Lucien	1,222	38,872	11,128	160
Maud	707	14,564	5,436	93
Milroy	1,091	6,809	8,191	247
Naval Reserve, Northwest	879	999	7,001	59
Oconee, East	458	575	4,425	11
*Oklahoma City	5,513	687,065	82,935	579
Olympic	2,013	18,356	16,644	301
Oscar	412	14,791	5,209	257
Pauls Valley	817	20,201	7,799	66
Peavine	1,406	1,922	10,078	44
Peck, West	620	1,224	6,776	60
Perry, Northwest	391	2,177	3,823	36
Ramsey	615	15,606	6,394	32
Rich Valley, Southeast	437	590	4,410	15
Ringwood	1,338	5,924	19,076	228
Roulette Creek	537	979	5,021	12
*Seminole City	1,077	157,253	17,747	303
*Sholem-Alechem	12,239	89,874	120,126	1,269
Soldier Creek	545	7,033	4,967	319
Sparks, East	679	2,417	5,583	101
Stroud	1,050	19,760	10,240	309
*St. Louis	1,440	177,297	22,703	407
*Tatums	3,466	70,510	39,490	1,073
*Tonkawa	292	125,267	4,733	83
*Velma	18,634	84,848	165,152	2,522
Velma, West	365	3,749	3,251	45
Wanette, East	380	815	4,185	44
Watchorn, East	546	7,552	3,448	34
Wildhorse	450	16,717	5,283	389
Witcher	1,120	8,282	8,178	166
Woolsey	1,765	7,065	10,935	264
Yale-Quay	1,891	31,596	18,404	241
Northeast stripper area	7,307	407,386	107,634	13,154

PRODUCTION AND RESERVES—TEXAS†

(In thousands of barrels)

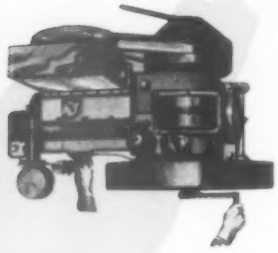
†Data for 1951 production (November and December estimated) and number of wells furnished by C. D. Lockwood, M & M Building, Houston.

SOUTHWEST TEXAS

RAILROAD DIST. 1:				
Charlotte	1,782	11,149	20,851	300
*Darst Creek	2,944	81,949	33,051	381
*Luling-Branyon	2,398	98,589	26,411	670
*Spraberry trend		(See District 8)		
Susan Peak	1,412	4,689	20,311	77

Only CSCO PUMPING ENGINES

Give You These 4 Outstanding Features



Easy and Safe to Start

A flip of the release cam and the flywheel momentum rides through the compression of the combustible mixture. This is possible because the simple hand control cam holds the *inlet valve* open (not exhaust valve), thereby releasing compression. Yet the *combustible mixture* is allowed to charge the cylinder during *free cranking*—an exclusive CSCO feature.

SAFE! Impulse does not trip until after dead center . . . so, *it can't kick back!*

Easy to Service

There's no need to stop a CSCO to check oil level . . . to add oil . . . to check water level . . . or to add water. And you can SEE when an oil change is needed, for on a CSCO the oil level is plainly visible at all times. Instant wrenchless access to the crankcase, through the extra large opening, makes oil changing and cleaning out of the oil sump *easy and quick.*

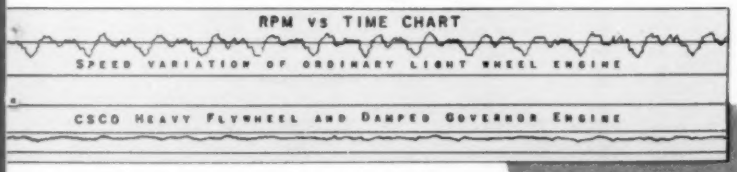
Since there's no need to stop, there's no need to restart!

Easy to Repair

CSCO parts needing repair or attention can be removed from the engine with a minimum of disturbance of adjacent parts or assemblies. For CSCO design embodies *unit assemblies*, permitting quick and easy accessibility. For example, the piston and rod assembly is easily removed through the crankcase without draining the water or oil. *No other essential parts are disturbed!*

CONTINENTAL

Smooth Steady Operation



The degree of damping* chosen for CSCO Pumping Engines is exactly suited to their extra heavy flywheels. They team up to produce the smoothest running engine on oil well pumping. The flywheel inertia provides the peak power while the oil damped governor holds the throttle steady, thus permitting engine to average the power, *up to its full capacity.*

No need to derate CSCO Engines on oil well pumping!

A DEPENDABLE WORKER ALWAYS SAVES YOU MONEY!

Since a CSCO Pumping Engine is easier to maintain and gives smoother and steadier performance, it is more economical to operate. Costly shut-downs are held to a minimum. In fact, when renewal of a CSCO is desired, all work can be done *on location!* Write or ask your Continental man for a CSCO bulletin and complete details on the full line.

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION MEMBER

THE CONTINENTAL SUPPLY COMPANY, *General Offices:* **DALLAS, TEXAS**

Export Division: The Continental Supply Co., Inc., 30 Rockefeller Plaza, New York, N. Y.
The Continental Supply Company, 134-135 Salisbury House, London Wall, London E.C.2, England
The Continental Supply Company, Limited, 216 Lancaster Building, Calgary, Alberta

Representatives: ARGENTINA • BOLIVIA • BRAZIL • CHILE • COLOMBIA • ECUADOR • PERU • TRINIDAD • URUGUAY • VENEZUELA

SOUTHWEST TEXAS (Continued)

	1952 production	January 1, 1953 Cumulative	January 1, 1953 Estimated reserves	January 1, 1953 No. of wells
RAILROAD DIST. 4:				
*Agua Dulce and Stratton	8,065	106,824	118,176	471
Borregas	1,428	5,575	19,425	66
Brayton	1,210	5,797	26,203	62
Colorado	876	12,535	9,465	169
Conoco Driscoll	796	14,391	10,609	59
Flour Bluff and East	1,056	19,826	10,174	104
Fulton Beach	1,402	5,623	19,377	113
Garcia	1,295	10,568	14,432	131
Government Wells, North	1,186	68,427	16,573	362
Hoffman	1,897	23,823	21,177	485
Kelsey	3,039	20,657	39,343	276
*La Gloria	4,930	47,042	102,958	247
Loma Novia	911	38,658	11,342	306
London Gin	1,193	3,545	14,455	67
Midway	1,344	16,438	15,562	99
Mustang Island	2,168	3,416	21,584	85
*Plymouth and East	5,167	64,382	45,618	270
Portilla	4,639	8,969	43,031	107
Red Fish Bay	1,324	1,504	26,496	52
Richard King	745	12,120	7,880	76
Rincon	3,080	28,109	36,891	192
Saxet	1,029	77,275	12,725	115
*Seeligson	13,382	109,410	390,590	862
Seven Sisters	1,655	38,605	21,395	325
Sinton and North and West	2,305	6,622	25,378	161
Sun and North	1,223	15,807	14,193	141
Taft and East and West	1,473	16,364	15,636	133
*Tijerina-Canales	3,396	25,952	94,048	185
White Point, East	3,303	48,692	41,308	280
Willamar	3,149	27,666	32,334	252

TEXAS GULF COAST

RAILROAD DIST. 2:				
Bloomington	1,768	9,572	18,428	136
Bonnie View	897	7,151	8,849	79
Burnell-Tulsita	3,237	16,270	33,730	94
Falls City	1,228	9,221	15,779	71
Ganada and West	1,094	7,182	14,818	116
*Greta	3,336	61,047	48,953	213
Helen Gohlke	2,177	3,174	36,826	108
Heyser	1,487	38,219	21,781	202
La Ward, North	724	8,883	9,117	98
Lolita	1,586	22,292	19,708	224
McFaddin and East	1,626	20,318	19,682	94
Placedo	1,634	34,464	25,536	206
*Refugio	2,589	68,872	81,128	248
Roche	842	4,810	10,190	46
Slick	885	11,106	11,894	47
*Tom O'Connor	12,876	185,091	274,909	657
*West Ranch	6,852	79,193	120,807	552
RAILROAD DIST. 3:				
Amelia	1,003	20,469	11,531	88
*Anahuac	7,032	114,837	150,163	326
*Barbers Hill	2,141	96,224	23,776	141
Bay City	1,050	18,346	9,654	53
Beaumont, West	636	10,257	5,743	57
Blue Ridge	895	14,852	10,148	114
Boling	1,520	15,263	14,737	169
Cedar Point	822	9,013	7,987	38
Chocolate Bayou	4,946	39,787	45,213	97
Clear Lake	773	13,403	8,597	45
*Conroe and West	12,857	319,218	280,782	829
Dyersdale	1,344	11,416	13,584	105
Esperson	773	21,399	8,601	96
Fairbanks	1,336	33,666	16,334	261
Fannett	1,747	24,147	17,853	78
Fig Ridge	983	15,644	10,356	75
Gillock-Dickinson	2,816	39,758	28,242	182
*Goose Creek	3,162	91,299	43,701	330
Hankamer	827	10,460	7,540	81
*Hastings	14,750	226,863	273,137	641
High Island	2,299	33,703	22,297	123
Houston, South	1,256	22,524	12,476	76
*Hull	2,825	118,801	51,199	239
*Humble	1,045	136,247	23,753	269
*Katy and North	8,589	53,715	96,285	64
Lake Creek	1,338	23,949	11,051	3
Liberty, South	1,670	23,755	18,245	144
Livingston	1,208	20,410	14,590	138
Lovells Lake	1,080	19,017	13,983	92
*Magnet-Withers	3,733	60,633	49,367	397
Manvel	2,143	48,465	31,535	152
Markham	376	11,808	4,192	57
Markham, N.-Bay City, N.	1,237	14,696	12,304	78
Midfields	720	3,623	10,377	42
Moores' Orchard	754	6,154	9,846	34
*Old Ocean	6,241	75,635	124,365	147
Oyster Bayou	3,374	27,161	42,839	37
Phoenix Lake	601	635	11,365	15

TEXAS GULF COAST (Continued)

	1952 production	January 1, 1953 Cumulative	January 1, 1953 Estimated reserves	January 1, 1953 No. of wells
Pickett Ridge	847	9,414	8,586	71
Pierce Junction	1,617	44,865	20,135	109
Port Neches and North	1,895	16,140	18,860	88
Raccoon Bend	1,973	50,578	24,422	158
Red Fish Reef and East	808	9,279	8,721	40
Saratoga	760	35,219	9,781	306
Sheridan	1,766	18,356	21,644	5
Silsbee and West	2,477	17,542	32,458	61
*Sour Lake	1,813	91,471	33,529	289
*Spindletop	544	131,541	18,459	160
Stowell	2,238	36,551	33,449	90
Sugarland	1,291	51,803	16,197	41
Sugar Valley	1,462	11,649	20,351	120
*Thompson	11,880	174,603	145,397	338
Tomball	2,199	52,528	32,472	382
Village Mills	3,215	8,948	34,052	154
*Webster	13,686	189,262	260,738	204
*West Columbia	1,609	115,396	29,604	158

EAST TEXAS

RAILROAD DIST. 5:				
Corsicana	790	19,280	15,720	724
*Mexia	295	102,539	5,461	120
Opelika	1,237	27,412	12,588	59
Pickton	1,118	5,819	14,181	139
*Powell	320	119,960	5,040	127
Sulphur Bluff	702	20,058	6,942	63
*Van	11,398	232,377	167,623	583
RAILROAD DIST. 6:				
Carthage	981	19,628	8,372	50
Cayuga	1,617	55,390	14,610	178
Chapel Hill	1,203	14,514	12,486	62
*East Texas	96,539	2,983,152	2,116,848	21,068
*Hawkins	16,044	147,871	352,129	623
Long Lake	1,642	35,210	16,790	171
Merigale-Paul	710	6,487	11,513	143
Midway Lake	635	982	9,018	62
New Hope	2,315	15,485	24,515	63
Pewitt Ranch	1,683	4,018	17,982	118
Pine Mills	1,014	2,638	14,362	91
Quitman	2,863	25,561	27,439	167
Rodessa		(See North Louisiana)		
*Talco	6,429	136,136	93,864	706
Waskom	1,360	4,506	13,494	122

NORTH TEXAS

RAILROAD DIST. 7-B:				
Hamlin, East	822	1,893	13,107	66
Round Top	1,818	7,744	22,256	160
Wimberly	933	11,316	12,684	197
RAILROAD DIST. 9:				
*Burkburnett	2,539	172,232	37,768	1,630
*Electra	2,420	169,299	35,701	2,751
Hull-Silk-Sikes	1,903	44,556	35,444	415
Joy	300	8,621	13,379	189
Kempner	633	3,423	11,577	118
*K.M.A.	1,998	103,706	61,294	1,349
Reno	623	2,728	9,272	110
Richardson-Mueller	967	3,103	8,897	55
Rusmag	1,753	2,791	17,209	134
Sherman and East	1,596	5,900	19,100	137
Sivells Bend	875	8,221	11,779	60
Vogtsberger	1,447	6,512	16,488	196
Walnut Bend	3,929	34,614	50,386	344
Worsham-Steed	1,460	4,571	11,429	138

WEST TEXAS

RAILROAD DIST. 7-C:				
Benedum	4,046	10,843	39,157	191
*Big Lake	984	111,747	18,253	177
Cree-Sykes	2,456	3,852	19,148	167
Elkhorn	837	880	9,120	25
Fort Chadbourne	419	4,756	30,244	34
Hulldale	1,392	1,863	28,137	44
Jameson	3,506	11,057	38,943	170
*McCamey	3,079	87,125	42,875	937
*Pegasus	4,365	9,907	190,093	119
Todd	3,329	26,663	43,337	99
Vaughn	1,552	4,215	17,785	255
Wilshire	3,832	4,294	45,706	38
World	1,561	17,544	17,456	183
RAILROAD DIST. 8:				
Abell	1,264	12,661	27,339	134
Adair	2,676	7,454	27,546	173
Andector	6,667	26,971	71,029	131

WEST TEXAS (Continued)

	1952 production	January 1, 1953 Cumulative	Estimated reserves	No. of wells
Anton Irish	2,743	12,598	27,402	163
Bedford	668	4,945	10,055	14
Block 31	3,489	15,778	44,222	82
Cedar Lake	1,810	11,037	23,963	144
*Cogdell	8,118	18,657	101,343	364
*Cowden, North and South	9,844	130,019	119,981	1,129
*Diamond "M"	13,398	29,832	155,168	588
*Dollarhide	7,311	30,684	94,316	320
Embar	1,062	13,068	11,932	36
Fort Stockton	923	3,099	11,901	156
*Foster	4,758	73,681	51,319	650
Fuhrman Mascho	1,451	18,330	19,670	291
*Fullerton	8,748	90,828	234,172	728
Garza	3,186	18,296	31,704	450
*Goldsmith	18,699	152,676	227,324	1,982
Good	1,812	5,577	22,423	49
*Hendrick	1,161	217,332	32,668	202
*Howard-Glasscock	5,618	155,225	79,775	1,047
Iatan East Howard and N. Jordan	1,164	29,665	15,335	505
*Kelly-Snyder	4,228	33,715	46,285	364
*Keystone	27,004	80,649	519,351	1,183
*Levelland	11,220	111,234	238,766	874
Mabee	11,783	60,450	139,550	1,867
Martin	771	7,921	12,079	94
*McElroy	2,888	15,333	34,667	79
Means	7,431	227,076	102,924	922
Midland Farms	1,626	20,833	19,167	257
Penwell	7,467	21,077	68,923	301
Reinecke	793	32,971	12,029	188
Salt Creek	2,923	7,220	67,780	70
Sand Hills	2,688	5,663	54,337	106
*Seminole	4,099	42,300	52,700	449
Shafter Lake	5,610	70,057	109,943	348
Sharon Ridge	2,814	13,795	41,205	101
*Slaughter	1,324	15,355	64,645	844
*Snyder and North	13,669	185,309	314,691	2,383
Spraberry, Deep	955	6,490	143,510	158
*Spraberry trend area‡	752	2,372	12,628	42
Sweetie Peck	29,288	39,368	185,632	2,118
Three Bar	944	3,125	56,875	39
Toborg	1,499	6,854	18,146	60
Tunstill	3,766	21,670	38,330	957
*TXL	1,528	4,953	20,047	161
Vealmoor and East	12,075	101,116	173,884	324
Von Roeder	5,015	11,064	63,936	158
Waddell	1,280	2,644	12,356	50
*Ward Estes, North	1,113	20,000	15,000	179
*Ward, South	2,724	75,692	54,308	924
*Wasson	7,673	43,929	56,071	586
Wellman	19,941	256,198	393,802	1,694
Wheeler	1,862	2,835	22,165	27
Yarborough and Allen	1,758	18,988	31,012	84
*Yates	2,455	7,635	27,365	57
	12,883	399,547	400,453	623

‡Includes all proved Spraberry acreage south of north line of Midland County (except Benedum) in Districts 7-C and 8.

PANHANDLE

RAILROAD DIST. 10:				
*Badger	2,226	74,787	30,213	1,093
*Borger-Pantex	3,129	118,792	46,208	583
*Finley	3,798	97,978	52,022	552
*West Pampa	3,393	105,820	49,180	1,098

PRODUCTION AND RESERVES—RKY. MOUNTAINS

(In thousands of barrels)

COLORADO

Iles Dome	373	14,342	5,658	21
Mount Hope	590	778	9,222	46
*Rangely	22,346	119,986	220,014	529
Wilson Creek	2,641	24,139	25,861	35
Yenter	851	1,251	10,749	49

MONTANA

Bowes Dome	1,042	1,483	8,517	32
*Cut Bank	2,760	72,605	37,395	1,205
Elk Basin		(See Wyoming)		
Kevin-Sunburst	1,256	57,828	17,172	1,486
Pondera	685	10,423	9,577	309
Poplar, East	369	369	29,631	12
Ashley Valley	983	3,486	6,514	30
Red Wash	491	585	19,415	20

WESTERN NEBRASKA

Huntsman	374	1,112	3,888	26

NORTH DAKOTA

*Beaver Lodge-Tioga	1,418	1,447	122,553	82

UTAH

	1952 production	January 1, 1953 Cumulative	Estimated reserves	No. of wells
WYOMING				
Beaver Creek	699	1,546	28,454	23
Big Muddy	1,149	34,187	10,813	183
Big Sand Draw	2,394	13,658	36,342	13
Bonanza	1,533	2,119	17,881	35
Byron	1,540	28,616	21,384	66
Cole Creek and South	1,838	8,640	16,360	68
Crooks Gap	607	4,983	5,017	9
*Elk Basin†	9,296	73,446	201,554	294
Elk Basin, South	503	2,664	9,336	17
Frannie	3,840	26,493	23,507	116
Garland	2,835	21,920	28,080	93
Glenrock	2,295	4,311	15,689	84
Golden Eagle	445	916	9,084	6
Grass Creek	2,363	43,737	16,263	276
Hamilton Dome	3,122	26,470	33,530	96
LaBarge	378	12,873	3,127	155
*Lance Creek	1,802	90,484	29,516	220
Little Buck Creek	728	4,109	5,819	24
Little Buffalo Basin	924	6,988	8,012	23
Lost Soldier	3,347	51,046	38,954	49
Meadow Creek and North	2,003	3,332	31,668	140
Mush Creek area	2,535	15,595	29,405	405
*Oregon Basin	2,636	57,014	62,986	125
Pilot Butte	565	4,840	5,160	34
Quealy	484	4,441	3,559	22
Rock River	494	29,320	5,680	28
Sage Spring Creek	877	1,804	8,196	22
*Salt Creek	4,010	347,737	62,263	1,186
Steamboat Butte	1,434	19,314	20,686	29
Sussex	1,034	3,024	11,976	66
Wertz	1,839	23,504	16,496	27
Winkleman Dome	810	4,957	7,043	9
Worland	1,487	10,260	21,740	30

†Includes Montana portion of field.

PRODUCTION AND RESERVES—APPALACHIAN

(In thousands of barrels)

PENNSYLVANIA-NEW YORK

*Allegany	3,166	141,654	53,377	(?)
*Bradford	9,669	555,192	100,872	(?)

WILLIAMS-AUSTIN COMPANY
PIPE LINE CONTRACTORS

Expansion Projects Total More Than 30,000 Miles

by Paul Reed
Pipe-Line Editor

PLANS of petroleum and natural-gas pipe lines for 30,300 miles of lines in the United States and abroad indicate a scale of expansion which is comparable with the activity of the recent big years.

Domestic natural-gas projects lead with proposals for 13,790 miles. The new era of products-pipe-lines expansion in the United States is reflected in plans for 4,760 miles. Crude-oil lines plan 3,000 miles in this country. Foreign lines planned for petroleum and natural gas total 8,750 miles.

At the end of 1952, the total of domestic and foreign projects completed and still under way was 19,540 miles. Operations last year were at a high level in spite of the setbacks due to the effect of the steel strike.

Included in the 11,150 miles completed in the United States, natural-gas lines are out in front with 5,000 miles. Domestic products systems laid 1,750 miles. Crude-oil lines completed projects totaling 4,400 miles.

The longest of the crude-oil lines finished in 1952 is Platte Pipe Line Co.'s 1,100-mile line from the Rockies to Wood River, Ill. The most spectacular line under way is Trans Mountain Oil Pipe Line Co.'s 711-mile crude oil line from western Canada to Vancouver, B. C., which will be finished this year. The biggest new crude-oil job ahead is Lakehead Pipe Line Co.'s 635-mile, 30-in. to extend the Interprovincial-Lakehead system from Lake Superior to Sarnia, Ont.

The longest products line to be built this year will be Continental Pipe Line Co.'s 600-mile, 8-in. from Billings, Mont., to Spokane, Wash.

Southern Natural Gas Co. is engaged in a 1,235-mile expansion program. Large natural-gas undertakings in prospect are: Gulf Interstate Gas Co.'s system of 1,189 miles; El Paso Natural Gas Co.'s program for 1,000 miles and Pacific Northwest Pipeline Corp.'s project of 1,700 miles.

The large scale of preparations for the future show that the industry is in the midst of prolonged expansion.

Table 1—Domestic Crude-Oil Projects Planned and Under Way

Company—	Miles	Inch	Status	Location and completion date
California-Oregon Pipe Line Co.	103	6	Proposed	Crescent City, Calif., to Medford, Ore.
Cooperative Refinery Association	48	6	Planned	Phillipsburg, Kans., to Holdredge, Neb.
Gulf Refining Co.	55	10	Planned	Bay Marchand to Plaquemines, La.
Humble Pipe Line Co.	71	16-18	Planned	East Texas to Louisiana-Texas line. 10-53.
Interstate Oil Pipe Line Co.	22	18	Planned	Texas line to Finney station, Louisiana. 2-53.
Interstate Oil Pipe Line Co.	123	22	Planned	Finney station, Louisiana, to Bunkie, La. 9-53.
Interstate Oil Pipe Line Co.	20	22	Planned	Bunkie station to Anchorage, Louisiana. 7-53.
Interstate Oil Pipe Line Co.	68	16	Planned	Raceland to Anchorage terminal, Louisiana. 5-53.
Lakehead Pipe Line Co.	635	30	Proposed	Superior, Wis., to Sarnia, Ont.
Magnolia Pipe Line Co.	29	8	Planned	Midland County, Texas, area.
Pasotex Pipe Line Co.	146	10	Planned	Snyder to Wink, Tex.
Phillips Pipe Line Co.	50	14	Under way	Looping in vicinity of Duro and Rankin, Tex., areas.
Phillips Pipe Line Co.	45	12	Planned	From Rancho Pipeline to Sweeny, Tex., refinery. 6-53.
Progress Pacific Pipe Line Co.	1,100	24	Planned	Odessa, Tex., to Los Angeles Harbor, Calif.
Pure Transportation Co.	50	8	Planned	Kimball to Gurley, Neb. 3-1-53.
Rancho Pipe Line System	455	24	Under way	McCamey to Houston, Tex.
Roosevelt Oil & Refining Corp.	22	4-6	Planned	St. Helens to Norwich, Mich.
Service Pipe Line Co.	170	12	Planned	Tioga to Williston, N. D.
Service Pipe Line Co.	185	16	Planned	Bowie, Tex., to Drumright, Okla.
Service Pipe Line Co.	29	4-6-8	Planned	Natrona County, Wyoming.
Service Pipe Line Co.	30	6	Planned	Knox and Haskell counties, Texas.
Texas-New Mexico Pipe Line Co.	48	8	Planned	Lovington, N. J.
Texas Pipe Line Co.	34	6	Under way	Sour Lake to Port Arthur, Tex.
Union Oil Co. of California	40	8-10	Planned	San Joaquin Valley and Los Angeles basin, California.
West Coast Pipe Line Co.	960	20-22	Planned	Snyder, Tex., to Norwalk, Calif.

Table 2 — Domestic Products Pipe-Line Projects Planned and Under Way

Company—	Miles	Inch	Status	Location and completion date
Bell Oil & Gas Co.	130	6	Planned	Ardmore to Drumright, Okla.
Coastal Products Pipe Line Co.	260	20	Planned	Houston to Baton Rouge, La.
Continental Pipe Line Co. (Yellowstone line)	600	8	Planned	Billings, Mont., to Spokane, Wash.
Evangeline Products System	196	16	Planned	Port Arthur, Tex., to Baton Rouge, La.
Harbor Products System	86	16	Planned	Woodbury Junction, Philadelphia, to Trembley Point, N. J.
Indiana Farm Bureau Cooperative Assn., Inc.	230	4-8	Under way	Mount Vernon to Peru, Ind.
Phillips Petroleum Co.	52	10	Planned	Shell Brookshire station to Sweeny, Tex., refinery. 5-53.
Phillips Pipe Line Co.	47	14	Planned	Looping from Odessa to Borger, Tex. 5-53.
Phillips Pipe Line Co.	67	12	Planned	Looping between Borger, Tex., and Paola, Kans. 6-53.
Pioneer Pipe Line Co.	310	8	Under way	Sinclair, Wyo., to Salt Lake City.
Plantation Pipe Line Co.	82	14	Proposed	Charlotte, N. C., to Greensboro, N. C.
Salt Lake Pipe Line Co.	140	8	Under way	Pasco to Spokane, Wash.
Standard Oil Co. (Ind.)	309	12	Under way	Sugar Creek, Mo.-Dubuque, Iowa.
Standard Oil Co. (Ind.)	243	10-12	Planned	Whiting, Ind., to River Rouge, Mich.
Sun Pipe Line Co.	110	8	Under way	Fostoria to Hudson, Ohio.
United States Pipe Line Co.	1,676	22-26	Planned	Beaumont, Tex., to Newark, N. J.
Wolverine Pipe Line System	200	14	Planned	Chicago to Detroit and Toledo.

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Table 3—Domestic Natural-Gas Pipe-Line Projects Planned and Under Way

Company—	Miles	Inch	Status	Location and completion date
Allied Gas Co.	....	6	Proposed	McLean to Champaign County, Illinois.
Arkansas-Missouri Power Co.	140	2-10	Planned	St. Francis River, Clay County, Arkansas, to near Campbell, Mo.
Associated Natural Gas Co.	88	..	Planned	Missouri.
Carolina Natural Gas Corp.	185	2-12	Proposed	Lateral lines off Transcontinental in North and South Carolina.
Chattahoochee Natural Gas Co.	70	..	Planned	Floyd County to Dalton, Ga.
Coast Counties Gas & Electric Co.	40	3-4-8	Considered	Coast and Valley region, California.
Colorado Interstate Gas Co.	250	20	Under way	Kit Carson, Colo., to Amarillo, Tex.
East Tennessee Natural Gas Co.	150	16	Planned	Knoxville to Kingsport, Tenn. 11-53.
El Paso Natural Gas Co.	822	..	Proposed	Looping from Permian basin, New Mexico, and West Texas fields to California.
El Paso Natural Gas Co.	181	..	Proposed	Field transmission lines.
El Paso Natural Gas Co.	97	..	Proposed	Loops on main line from Permian basin to California.
Glacier Gas Co.	285	20	Proposed	Kalispell, Mont., to Spokane, Wash.
Gulf Interstate Gas Co.	860	30	Proposed	Acadia Parish, Louisiana, to Boyd County, Kentucky.
Gulf Interstate Gas Co.	329	12-24	Proposed	Laterals off Acadia Parish, Louisiana, to Boyd County, Kentucky, line.
Home Gas Co.	46	12	Under way	Tioga and Broome counties, New York.
Home Gas Co.	32	..	Planned	Breesport to Union Center, N. Y.
Hope Natural Gas Co.	33	8-10-13	Planned	Wyoming County, West Virginia, southerly to Buchanan County, Virginia.
Interstate Power Co.	26	8	Proposed	From Natural Gas Pipe Line Co. of America line near Hooppole, Ill., to Clinton, Iowa.
Iowa-Illinois Gas & Electric Co.	41	10	Proposed	Washington County to Cedar Rapids, Iowa.
Kansas-Nebraska Natural Gas Co., Inc.	179	..	Under way	Kansas and Nebraska.
Lone Star Gas Co.	100	..	Proposed	Storage fields to the Dallas-Fort Worth area.
Lone Star Gas Co.	35	12	Proposed	Southeastern Schleicher County, Texas.
Manufacturers Light & Heat Co.	40	..	Proposed	Allegheny, Washington, and Beaver counties, Pennsylvania.
Manufacturers Light & Heat Co.	213	3-26	Proposed	Various points on system in Pennsylvania, West Virginia, and Ohio.
Michigan Gas Storage Co.	30	26	Planned	Laingsburg Junction north. 7-53.
Michigan Gas Storage Co.	93	16-22-24	Under way	Laingsburg to near Pontiac and Mt. Clemens, Mich.
Mid South Gas Co.	191	..	Planned	Helena to Palestine, Ark.
Missouri Central Gas Co.	25	6	Contracted	Moberly to Macon, Mo.
Missouri Public Service Co.	135	8-10	Proposed	New Franklin to Trenton, Mo.
Montana Power Co.	52	16	Planned	Canada-Montana border to Cut Bank, Mont.
Natural Gas Producers, Inc.	100	12	Planned	Yenter pool to Denver, Colo.
Nevada Natural Gas Pipe Line Co.	114	10	Proposed	Topock, Ariz., to Las Vegas, Nev.
New River Gas Co.	50	..	Planned	Summers or Monroe counties, West Virginia, to Narrows and Dublin, W. Va.
New York Electric & Gas Corp.	50	8-10-24	Proposed	Oneonta and Norwich to DeRuyter, N. Y.
New York State Natural Gas Corp.	104	14-16-20	Authorized	Looping in Westmoreland, Armstrong, and Tioga counties, Pennsylvania.
New York State Natural Gas Corp.	21	..	Proposed	Columbiana and Stark counties, Ohio.
Niagara Mohawk Power Co.	55	10	Contracted	Watertown to Syracuse, N. Y.
Northern Indiana Fuel & Light Co.	33	8	Proposed	Edgerton to Auburn, Ind.
Northern Natural Gas Co.	400	24	Proposed	Emerson, Man., south to Red River Valley through Fergus Falls on to St. Paul.

"Welding 8" line preparatory to shoving across a South Louisiana marsh"

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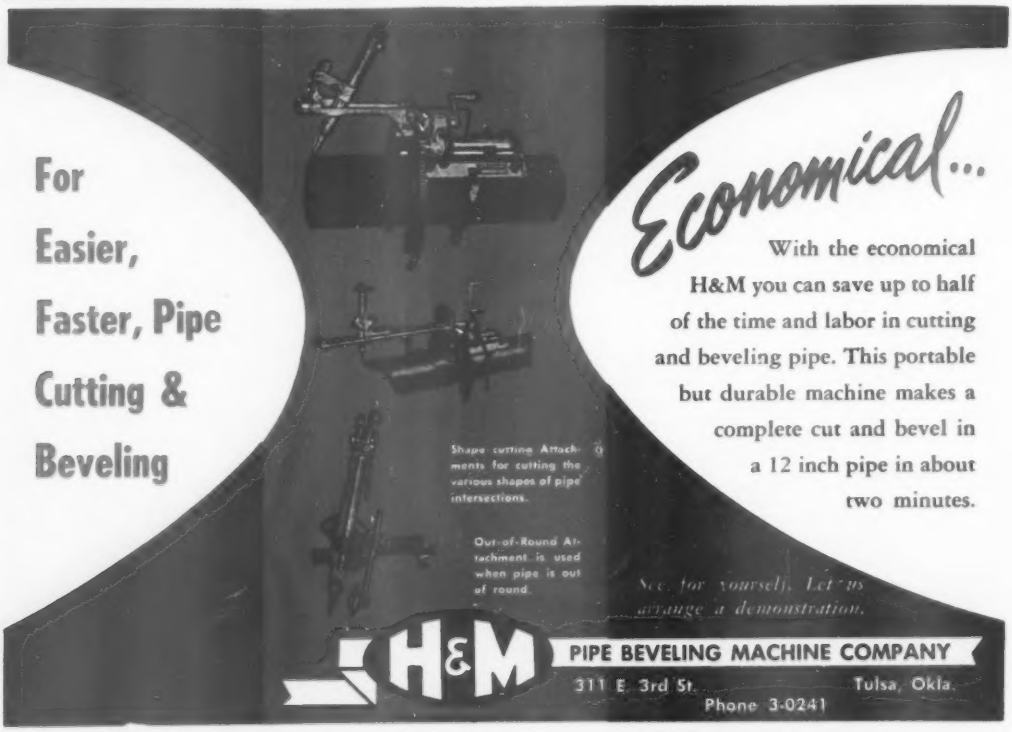
TABLE 3—DOMESTIC NATURAL-GAS PIPE-LINE PROJECTS PLANNED AND UNDER WAY (Continued)

Company—	Miles	Inch	Status	Location and completion date
Northern Natural Gas Co.	102		Planned	Extension.
Northern Natural Gas Co.	580		Proposed	Loops in Kansas, Texas, Oklahoma, and Nebraska.
Northern Natural Gas Co.	140	4-6-8-12	Under way	Gathering system south of Rolla, Kans., to Guymon, Okla.
Northwest Natural Gas Co.	750	18-20-22-24	Planned	Washington, Oregon, and Idaho.
Ohio Fuel Gas Co.	61		Planned	Northern and southwestern Ohio.
Ohio Fuel Gas Co.	22	16	Planned	Dayton, Troy, Piqua, and Sidney, Ohio.
Ohio Fuel Gas Co.	74	3 to 20	Planned	Hocking, Knox, and Ashland counties, Ohio.
Oklahoma Natural Gas Co.	50	18	Planned	Sapulpa to Choteau, Okla. 7-53.
Pacific Gas & Electric Co.	141	34	Proposed	Parallel sections along Topock-Milpitas, Calif., line.
Pacific Northwest Pipeline Corp.	1,384		Proposed	Ignacio, Colo., to Bellingham, Wash.
Pacific Northwest Pipeline Corp.	316		Proposed	Laterals and spurs off main line to Pocatello, Idaho, to Yakima, Wash.
Permian Basin Pipeline Co.	384	20-30	Proposed	Permian basin area to eastern New Mexico, on to Skellytown, Carson County, Texas.
Phillips Petroleum Co.	250	2-30	Under way	Spraberry field gas system—Midland and Glasscock counties, Texas. 4-53.
Phillips Petroleum Co.	65	4-30	Under way	Goldsmith field system, Texas. 3-53.
Phillips Petroleum Co.	125	2-24	Planned	Pembrook and Benedum field gas system—Midland, Upton, Glasscock, and Reagan counties, Texas. 6-53.
Phillips Petroleum Co.	28	10	Planned	Bayou plant to Adams terminal, Texas. 7-53.
Public Service Co. of Colorado	95		Proposed	Douglas Creek and other gas fields to Grand Junction, Colo., area.
Public Service Co. of North Carolina	83	8	Planned	Kings Mountain to Asheville, N. C. 3-1-53.
Rockland Light & Power Co.	22	8	Proposed	Orangetown to Tomkins Cove, N. Y.
Shenandoah Gas Co.	39	3-4-9	Proposed	Middletown, Va., to Martinsburg, W. Va.
Southern California Gas Co., and Southern Counties Gas Co. of California	87	30	Contracted	Whitewater to Desert Center, Calif., loops.
Southern Natural Gas Co.	1,235	24-4	Proposed	Louisiana, Mississippi, Alabama, and Georgia. Fall 1953.
Southern Union Gas Co.	21	20	Proposed	Albuquerque, N. M.
Southern Union Gas Co.	30	12-20	Contracted	San Juan County, New Mexico.
Southwest Gas Corp., Ltd.	26		Proposed	From Pacific Gas & Electric line to Victorville, Calif.
Texas Eastern Transmission Corp.	315	24	Proposed	Provident City, Tex., to Castor, La.
Texas Gas Transmission Corp.	408	26	Under way	Looping from Bastrop, La., to Jeffersontown station near Louisville, Ky.
Texas-Ohio Gas Co.	1,350	30	Proposed	Hidalgo County, Texas, through Arkansas, Mississippi, Tennessee, and Kentucky on to Spencer, W. Va. 6-30-53.
United Fuel Gas Co.	50	20-24	Planned	Wood County to Lanham, W. Va.
United Gas Pipe Line Co.	44	20	Planned	Lirette field to Harvey, La.
United Natural Gas Co.	50	12	Planned	Elk County to Jefferson County, Pennsylvania.
Utah Natural Gas Co.	96		Planned	Clear Creek field near Price to Salt Lake City.
Virginia Natural Gas Co.	153			Buckingham to Richmond and Portsmouth, Va.
Warren Petroleum Corp.	78	3-24	Proposed	Lovington, N. M. 9-53.
Wilcox Trend Pipe Line Co.	137	up to 20	Planned	Gathering system for delivery to proposed Texas Eastern terminal at Provident City, Tex.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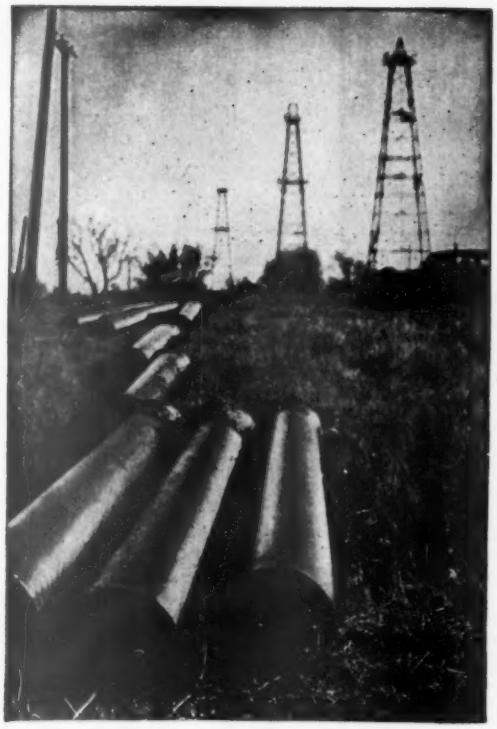

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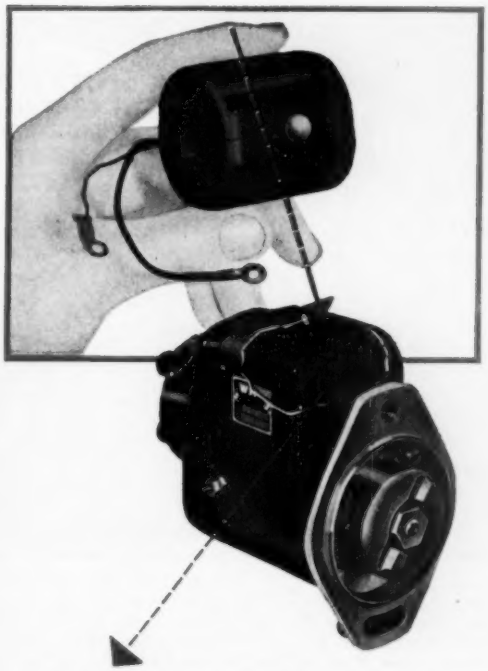

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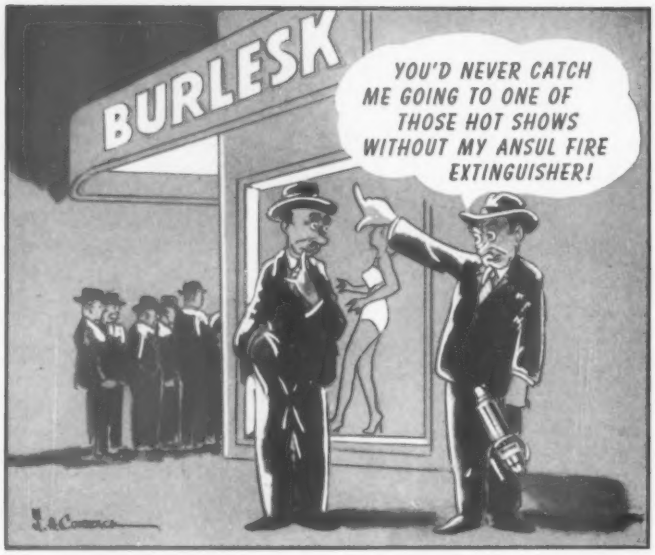

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SEE PAGE 352

AIR GAS AMMONIA

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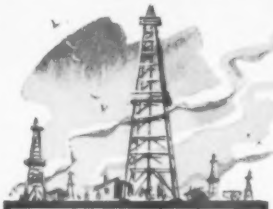

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Pipe Lines Completed During 1952

TABLE 4—COMPLETED DOMESTIC CRUDE-OIL PIPE-LINE PROJECTS

American Petroleum Co.—30 miles, 6-in., Village Mills to Arriola field, Hardin County, Texas. 5-52.

Cities Service Pipe Line Co.—64 miles, 18-in., Sour Lake, Tex., to Lake Charles, La. 1-1-53.

Cities Service Pipe Line Co.—19 miles, 8-in., Cushing to Guthrie, Okla. 6-1-52.

Cities Service Pipe Line Co.—20 miles, 8-in., Coyle to Cushing, Okla. 7-1-52.

Cities Service Pipe Line Co.—18 miles, 4-6-in., Edmond to Guthrie, Okla. 1-1-53.

Continental Pipe Line Co.—105 miles, 8-in., Rincon to Northwest of Sullivan City on to Port Isabel, Tex. 9-15-52.

Continental Pipe Line Co.—217 miles, 12-in., Wichita Falls, Tex., to Ponca City, Okla. 12-25-52.

Gulf Refining Co.—80 miles, 24-in., Midland to Colorado City, Tex.

Gulf Refining Co.—22 miles, 10-in., Wortham to Corsicana.

Interstate Oil Pipe Line Co.—32 miles, 20-in., Bunkie to Melville, La.

Interstate Oil Pipe Line Co.—52 miles, 16-in., Sunset to Anchorage, La.

Interstate Oil Pipe Line Co.—20 miles, 12-in., New Iberia, to Bayou Sale, La. 11-52.

Interstate Oil Pipe Line Co.—17 miles, 12-in., Raceland to LaRose, La. 8-52.

Interstate Oil Pipe Line Co.—22 miles, 8-in., Esperance Point, La., to Cranfield, Miss. 7-52.

Kaw Pipe Line Co.—18 miles, 12-in., Ellis, Russell, and Barton counties, Kansas. 12-52.

Malco Refineries, Inc.—60 miles, 4-in., Pettigrew, Tocito field to Hospah field (San Juan basin, New Mexico). 1-53.

Mid-Continent Pipe Line Co.—23 miles, 4-2-in., Elmore City to Velma, Okla. 3-52.

Ohio Oil Co.—66 miles, 10-in., Harpster to Newark, Ohio. 11-52.

Ohio Oil Co.—149 miles, 12-in., Lima to East Sparta, Ohio. 11-52.

Pasotex Pipe Line Co.—160 miles, 8-in., El Paso to Wink, Tex. 1-53.

Platte Pipe Line Co.—1,100 miles, 16-20-in., Worland, Wyo., to Wood River refining area in Illinois. 11-52.

Pure Transportation Co.—14 miles, 8-in., Dollarhide to Keystone, Tex. 1-53.

Service Pipe Line Co.—29 miles, 20-in., Drumright, Okla., to Humboldt, Kans. 4-52.

Service Pipe Line Co.—38 miles, 10-in., Cogdell to Aspermont, Tex. 1-52.

Service Pipe Line Co.—26 miles, 10-in., Saunders to Denton, N. M. 5-52.

Shell Pipe Line Corp.—24 miles, 8-in., Gohlke to Hallettsville, Tex.

Sinclair Pipe Line Co.—674 miles, 22-24-in., Drumright, Okla., to East Chicago, Ind.

Skelly Oil Co.—38 miles, 8-in., Lyons to Burrton, Kans. 1-52.

Socony-Vacuum Oil Co.—20 miles, 8-10-in., Hutchinson, Kans.

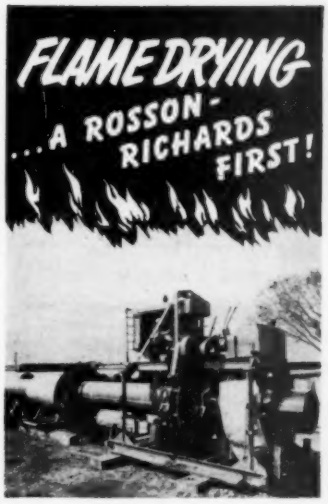
Southern California Edison Co.—41 miles, 8-in., Etiwanda to Santa Fe Springs, Calif. 10-52.

Sun Pipe Line Co.—34 miles, 8-in., Jameson to Colorado City, Tex. 12-52.

Sun Pipe Line Co.—20 miles, 6-in., Claytonville to Colorado City, Tex. 11-52.

Texas-Empire Pipe Line Co.—30 miles, 18-in., Wilmington to Lockport, Ill. 11-52.

Texas-New Mexico Pipe Line Co.—22 miles, 12-in., Crane County to McCamey.



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Texas Pipe Line Co.—218 miles, 22-in., Houma, La., to Port Arthur, Tex.

Texas Pipe Line Co.—175 miles, 16-in., Corsicana to East Houston. 8-52.

West Texas Gulf Pipe Line Corp.—467 miles, 24-26-in., 26-in. Colorado City to Wortham, Tex.; 24-in., Wortham to Sour Lake, Tex. 1-53.

TABLE 5—COMPLETED DOMESTIC PRODUCTS PIPE-LINE PROJECTS

Buckeye Pipe Line Co.—77 miles, 16-in., Macungie, Pa., to Linden, N. J. 10-52.

Derby Oil Co.—30 miles, 4-in., Wichita to Bell, Kans. 9-1-52.

Derby Oil Co.—56 miles, 4-in., Wichita to McPherson, Kans. 10-52.

Gulf Refining Co.—78 miles, 8-in., Port Arthur to Deer Park, Tex. 6-52.

Gulf Refining Co.—28 miles, 8-in., El Vista to Orange, Tex. 6-52.

Gulf Refining Co.—30 miles, 6-in., Deer Park to Texas City, Tex.

Keystone Pipe Line Co.—60 miles, 12-in., Point Breeze, Pa., to Montello, Pa. 12-31-52.

Ohio Oil Co.—24 miles, 8-in., East St. Louis to Wood River, Ill. 9-52.

Ohio Oil Co.—255 miles, 8-10-in., East St. Louis, Ill., to Indianapolis. 11-52.

Phillips Petroleum Co.—50 miles, 8-in., Goldsmith to Spraberry, Tex. 11-52.

Phillips Pipe Line Co.—35 miles, 6-in., Okmulgee, Okla., to Tulsa. 11-52.

Salt Lake Pipe Line Co.—330 miles, 8-in., Salt Lake City, Utah, to Boise, Idaho. 12-52.

Shell Oil Co.—365 miles, 8-14-in., Wood River via East Chicago. Summer 1952.

Socony-Vacuum Oil Co.—175 miles, 6-8-in., Augusta, Kans., to Kansas City, Mo.

Standard Oil Co. (Ind.)—122 miles, 8-in., Neodesha, Kans., to Belton, Mo. 6-52.

Tuscarora Oil Co., Ltd.—27 miles, 12-in., Allentown to Reading, Pa. 9-52.

TABLE 6—COMPLETED DOMESTIC NATURAL-GAS PIPE-LINE PROJECTS

Algonquin Gas Transmission Co.—161 miles, 10-26-in., New Jersey to Connecticut River near New Haven. 9-52.

Algonquin Gas Transmission Co.—34 miles, 6-12-in., Massachusetts. 9-52.

Algonquin Gas Transmission Co.—202 miles, 3-16-in., Connecticut, Rhode Island, and Massachusetts. 10-52.

Cities Service Gas Co.—105 miles, 4-16-in., Hugoton field, Kansas. 10-52.

Cities Service Gas Co.—19 miles, 26-in., Welda to Ottawa, Kans. 11-52.

Colorado Interstate Gas Co.—16 miles, 20-in., Limon to Hugo, Colo. 1-53.

Colorado Interstate Gas Co.—22 miles, 6-in., Panhandle-Kit Carson to Fort Lyon, Colo. 10-52.

Cumberland & Allegheny Gas Co.—46 miles, 10-in., Mountain Lake Park, Md., to Preston County, West Virginia.

Dow Chemical Co.—70 miles, various sizes, area of Midland, Saginaw, and Bay City, Mich.

El Paso Natural Gas Co.—133 miles, 30-in., Kermit, Tex., to Colorado River. 12-52.

El Paso Natural Gas Co.—32 miles, 30-in., looping from Kingman to Colorado River. 12-52.

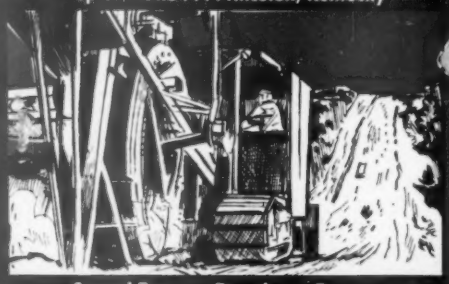
Equitable Gas Co.—20 miles, 16-in., Carnegie to Finleyville, Pa. 7-52.

Frederick Gas Co., Inc.—26 miles, 4½-in., Redlands to Frederick, Md. 9-8-52.

Fredericksburg Natural Gas Co.—29 miles, 3-4-in., Fredericksburg, Va., area.

Georgia Gas Co.—40 miles, 2-8-in., Bogart to Gainesville, Ga.

Spread One . . . Princeton, Kentucky



Spread Two . . . Dyersburg, Tennessee

Spread Three . . . Memphis, Tennessee

Spread Four . . . Clarksdale, Mississippi

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Houston Pipe Line Co.—50 miles, 24-in., Alvin to Wharton, Tex. 5-52.

Houston Pipe Line Co.—28 miles, 18-in., Alvin to Texas City, Tex. 2-52.

Houston Pipe Line Co.—50 miles, 16-in., Edna to Tom O'Connor, Tex. 9-52.

Iowa-Illinois Gas & Electric Co.—¾ through 6-in., Davenport, Iowa, and Moline, Ill.

Kansas-Nebraska Natural Gas Co., Inc.—49 miles, 10-in., Ogallala to North Platte, Neb. 10-52.

Kansas-Nebraska Natural Gas Co., Inc.—17 miles, 8-6-4-in., McCook to Cedar Bluffs, Neb. 11-52.

Kansas-Nebraska Natural Gas Co., Inc.—20 miles, 12-16-in., Hastings to Grand Island, Neb. 7-52.

Kansas-Nebraska Natural Gas Co., Inc.—49 miles, 4-16-in., vicinity of Lakin, Kans. 11-52.

Kansas Power & Light Co.—28 miles, 12-16-in., north of Kansas to Meade County gas field.

Kansas Power & Light Co.—25 miles, 8-in., northeast of McPherson, Kans., to Smoky Hill Air Force Base. 1-53.

Lake Shore Pipe Line Co.—75 miles, 10¾-in., T.G.T. connection at Cochranton, Pa., to Fairport via Ashtabula, Ohio.

Lone Star Gas Co.—70 miles, 20-in., Garvin County, Oklahoma, to Clay County, Texas. 12-52.

Lone Star Gas Co.—72 miles, 6 to 16-in., Freestone, Limestone, McLennan, Scurry, and Mitchell counties, Texas. 8-52.

Manufacturers Light & Heat Co.—18 miles, 12-in., Burnside, Clinton County, to Driftwood, Pa. 6-52.

Minneapolis Light & Power Co.—20 miles, 30-in., Minneapolis.

Mississippi River Fuel Corp.—40 miles, 18-in., Dubach to Perryville, La.

Mississippi River Fuel Corp.—96 miles, 18-16-in., Ruston, La., to Marshall, Tex.

Natural Gas Co. of West Virginia—23 miles, 8-10-in., Lisbon to Sebring, Ohio.

Natural Gas Storage Co. of Illinois—20 miles, 30-in., Dwight to Herscher, Ill. 12-52.

New York State Natural Gas Corp.—29 miles, 20-in., Tonkin station to Kittanning, Pa. 12-52.

Niagara Mohawk Power Corp.—55 miles, 10-in., Fulton to Watertown, N. Y. 9-52.

Niagara Mohawk Power Corp.—20 miles, 10-24-in., Syracuse. 10-52.

Northern Natural Gas Co.—580 miles, 4-26-in., loops in Kansas, Texas, Oklahoma, and Nebraska.

Ohio Fuel Gas Co.—25 miles, 20-in., Xenia, Ohio. 2-52.

Oklahoma Natural Gas Co.—26 miles, 12-in., Ringwood to Enid, Okla.

Oklahoma Natural Gas Co.—51 miles, 12-in., Bethany to El Reno; Henryetta to Morris; Haskell to Muskogee, Okla. 8-52.

Oklahoma Natural Gas Co.—20 miles, 8⅝-in., Wewoka, Okla., south. 12-52.

Pacific Gas & Electric Co.—44 miles, 8-in., Salinas to King City, Calif. 6-52.

Pennsylvania Gas Co.—52 miles, 12-in., Warren to Erie, Pa.

Phillips Petroleum Co.—75 miles, 4 to 30-in., Pembrook and Benedum fields Gas Interim System—Upton and Reagan counties, Texas. 12-52.

Phillips Natural Gas Co.—20 miles, 3-in. 1-53.

Piedmont Natural Gas Co.—36 miles, 8-10-12-in., west of Greensboro to Burlington. 9-52.

Public Service Co. of North Carolina—33 miles, 10-in., Burlington to Chapel Hill, N. C. 3-52.

Public Service Co. of North Carolina—29 miles, 4-in., Statesville to Kannapolis, N. C. 7-52.

Southern Union Gas Co.—27 miles, 10-in., Lea and Eddy counties, New Mexico. 1-53.

Sunray Oil Corp.—133 miles, 3-30-in., Snyder gasoline plant to Scurry County, Texas.

Tennessee Gas Transmission Co.—528 miles, 24-30-in., looping along present system in Texas, Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, Ohio, Pennsylvania, and New York.

Texas Eastern Transmission Corp.—791 miles, 30-in., Kosciusko, Miss., to Connellsville, Pa.

Texas Eastern Transmission Corp.—43 miles, 30-in., Wheeling, W. Va.

United Gas Pipe Line Co.—505 miles, 24-26-30-in., Agua Dulce field to Perryville, La. 10-5-52.

United Natural Gas Co.—20 miles, 12-in., Costello to Driftwood, Pa. 7-52.

MAXIMUM STORAGE FACILITIES MAINTAINED with a SHORTSTIR*

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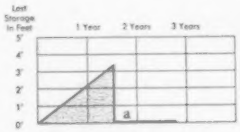

(a) tank cleaned and SHORTSTIR installed.

These records show that sediment had accumulated, in some cases, at the rate of over 2 feet per year. SEE GRAPH.

These tanks were cleaned and SHORTSTIR Mixers installed.

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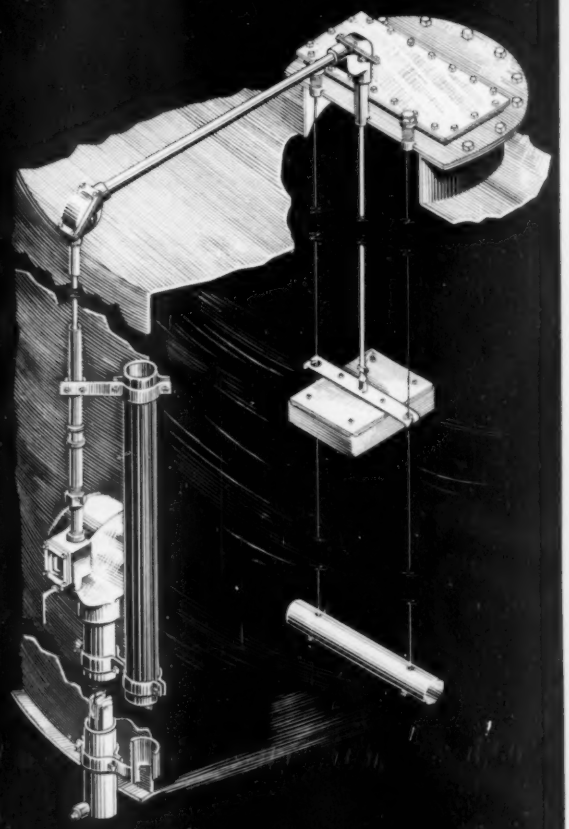
S. & J. makes a large line of automatic tank gauges to fit all types of tank construction and all normal operating pressures. If the illustration at the right does not fit your immediate needs, give us brief specifications on your storage and we will gladly submit drawings and estimates. Consultation is always welcome.



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Refining Capacity Undergoing Substantial Expansion

by R. B. Tuttle

CURRENTLY 11 new refinery projects are being considered for the United States and Canada. Now well along towards the authorization stage, most of the nine United States plants in this group are expected to be under way before the year's end. Canada's two new plants are on similar status.

In addition to the nine new United States refinery projects awaiting authorization are two other projects which are definitely scheduled to get under way early this year. Total capacity rating on these plants is 65,000 bbl. of crude oil daily. Starting date of two more authorized new plants has not been set as of mid-January. Capacity rating on these two refineries totals nearly 50,000 bbl. per day.

The four new plants which have been authorized will incorporate cat cracking and other modern processes in their operating layout.

Three of these plants are to be located along the United States-Canada border and in the Pacific Northwest. The fourth refinery is scheduled to be located in the southwest.

As of mid-January there were 10 authorized major projects covering additions to existing United States refineries. Three of these projects involve crude-oil-distillation capacity in excess of 60,000 bbl. daily. Another group of three projects cover catalytic cracking units averaging more than 20,000 bbl. per day each. More than 20,000 bbl. per day of new cat reforming capacity is made up by three other authorized projects.

Work now in progress throughout the country's refining industry for additional crude-oil capacity and replacement of obsolete equipment involves about 30 different plants. These projects are in various stages of completion with the majority of them scheduled for service before 1954.

Authorized but not yet started as of mid-January are three projects involving more than 60,000 bbl. per day of crude-oil capacity. A portion of this capacity is scheduled to be utilized for replacing older equipment. However, most of the capacity covered by these three projects will be added to the respective plant's existing capacities.

Active Refinery-Building Projects

Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Allied Chemical & Dye Corp., Orange, Tex.:				
Petrochemical plant		Building	1954	
American Liberty Oil Co., Mount Pleasant, Tex.:				
Cat cracker, bbl. per day	5,000	Building	1953	Fluor Corp.
Feed-preparation unit		Building	1953	
Ashland Oil & Refining Co., Catlettsburg, Ky.:				
Distillation facilities, bbl. per day	40,000	Building	Mid '53	
Cat cracker, bbl. per day	5,000	Building	Mid '53	
Rehabilitate alkylation unit		Authorized		
Ashland Oil & Refining Co., Findlay, Ohio:				
Distillation facilities, bbl. per day	6,000	Building	Mid '53	
American Petrochemical Corp., Gulf Coast:				
Petrochemical plant		Proposed		
Atlantic Refining Co., Port Arthur, Tex.:				
Cat reformer, bbl. per day	10,000	Authorized		
Atlantic Refining Co., Philadelphia:				
Cat reformer, bbl. per day	10,000	Building	Early '53	E. B. Badger & Sons Co.
Crude unit, bbl. per day	45,000	Building	1954	
Cat cracker, bbl. per day	30,000	Building	1954	
Alkylation unit, bbl. per day	3,000	Building	Late '53	
Ammonia plant, tons per day	100	Building	Mid '53	
Aurora Gasoline Co., Detroit:				
Increase cat cracker, bbl. per day	2,000	Building	1953	
Increase gas-concentration plant		Building		
Aurora Gasoline Co., Elsie, Mich.:				
Cat reformer		Planned	1953	
Bay Petroleum Corp., Denver:				
Cat cracker, bbl. per day	3,000	Building	Mid '53	Universal Oil Products Co.; Procon, Inc.
Feed preparation, bbl. per day	2,340	Building		
Revamp poly unit, bbl. per day	220	Building		
Gas-concentration unit		Building		
Ben Franklin Refining Co., Ardmore, Okla.:				
Cat cracker, bbl. per day	6,500	Building	1953	
Polymerization unit, bbl. per day	500	Building	1953	
Gas-concentration unit		Building	1953	
Distillation facilities, bbl. per day	6,000	Building	1953	
British American Oil Co., Ltd., Clarkson, Ont.:				
Cat cracker		Authorized	Early '53	
Caminol Co., Hanford, Calif.:				
Polymerization unit		Planned	1953	
California Refining Co., Perth Amboy, N. J.:				
Cat reformer, bbl. per day	10,000	Planned	1954	
Carbide & Carbon Chemicals Div., Torrance, Calif.:				
Petrochemical plant		Authorized		
Carter Oil Co., Billings, Mont.:				
Poly plant, bbl. per day	500	Building	1953	Blaw-Knox Construction Co.
Cities Service Oil Co. (Del.), East Chicago, Ind.:				
Refinery expansion		Building	1954	
Cities Service Oil Co. (Pa.), Linden, N. J.:				
Vacuum unit		Building	1954	

Active Refinery-Building Projects (continued)

Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Cities Service Refining Corp., Lake Charles, La.:				
Distillation facilities, bbl. per day	25,000	Building	1954	
Cat cracker	.....	Building	1954	
Hydroformer	.....	Building	1954	
Col-Tex Refining Co., Colorado City, Tex.:				
Cat reformer	1,500	Planned	1954	
Consolidated Chemical Industries, Inc., Baytown, Tex.:				
Petrochemical plant	.....	Planned	.....	
Continental Oil Co., Lake Charles, La.:				
Refinery expansion, bbl. per day	40,000	Building	1953	Stone & Webster Engr. Corp.; Badger Process Corp.
Platformer, bbl. per day	4,000	Building	1954	Universal Oil Products Co.; Procon, Inc.
Cat cracker	.....	Building	1954	
Consumers Coop. Refineries, Ltd., Regina, Sask.:				
Crude unit, bbl. per day	8,000	Authorized	Mid '54	
Vacuum unit, bbl. per day	6,500	Authorized	Mid '54	
Cat cracker, bbl. per day	4,500	Authorized	Mid '54	
Cooperative Refinery Assn., Phillipsburg, Kans.:				
Increase crude unit, bbl. per day	4,000	Building	Early '53	
Cat cracking unit, bbl. per day	4,000	Building	Early '53	
Poly unit	.....	Building	Early '53	
Gas-concentration unit	.....	Building	Early '53	
Deep Rock Oil Corp., Cushing, Okla.:				
Lube-oil solvent-refining plant, bbl. per day	1,075	Building	Early '53	M. W. Kellogg Co.; Refinery Engineering Co.
Delta Refining Co., Memphis:				
Cat cracker, bbl. per day	3,000	Building		Koch Engineering Co.
Diamond Alkali Co., Deer Park, Tex.:				
Petrochemical plant	.....	Contracted	.....	Brown-Root
Dominion Tar & Chemical Co., Ltd., Montreal, Que.:				
Petrochemical plant, lb. per day	40,000	Building	Early '53	
Dow Chemical Co., Freeport, Tex.:				
Petrochemical-plant addition	.....	Building	.....	
Dow Chemical Co., Midland, Mich.:				
Toluene plant	.....	Building	.....	Stone & Webster Engr. Corp.
Dow Chemical Co., Sarnia, Ont.:				
Petrochemical plant	.....	Building	.....	
Eldorado Refining Co., El Dorado, Kans.:				
Refinery expansion, bbl. per day	6,000	Building	1953	Refinery Engineering Co.
Cat cracker	.....	.....	1953	
Empire Petroleum Co., Denver:				
Refinery expansion, bbl. per day	5,000	Building	.....	
Esso Standard Oil Co., Everett, Mass.:				
Cat cracker, bbl. per day	18,500	Building	1953	Foster Wheeler Corp.

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Active Refinery - Building Projects (continued)

Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Esso Standard Oil Co., Baton Rouge:				
Increase crude-oil capacity, bbl. per day	60,000	Building	1953	M. W. Kellogg Co.
Expand cat cracker	25,000	Building	1953	
Esso Standard Oil Co., Virginia:				
New refinery, bbl. per day	40,000	Planned		
E. I. du Pont de Nemours & Co., Inc., Beaumont, Tex.:				
Petrochemical plant		Planned		
Frontier Oil Refining Corp., Tonawanda, N. Y.:				
Expand crude-oil capacity, bbl. per day	6,000	Building	1953	
Cat cracker, bbl. per day	7,500	Building	1953	
Gas-concentration unit		Building		
Additional polymer capacity		Building		
Vacuum-distillation unit		Building		
Asphalt facilities		Building		
Frontier Refining Co., Cheyenne, Wyo.:				
Expand cat cracker, bbl. per day	6,500	Building		Universal Oil Products Co.
Fulton & Olmstead, San Antonio:				
New refinery—				
Crude unit, bbl. per day	10,000	Authorized	1953	Koch Engineering Co.
Cat cracker, bbl. per day	4,650	Authorized	1953	Universal Oil Products Co.
Platformer, bbl. per day	1,640	Authorized	1953	
General Petroleum Corp., Ferndale, Wash.:				
New refinery—				
Crude unit, bbl. per day	35,000	Authorized	Late '54	
Cat cracker				
Thermal cracking				
Thermal reforming				
Vacuum distillation unit				
Gilcrease Oil Co., Meraux, La.:				
Cat cracking unit, bbl. per day	3,000	Planned	1954	
Gilmore Refineries, Inc., Odessa, Tex.:				
New refinery—				
Crude unit, bbl. per day	50,000	Planned		
Globe Oil & Refining Co., Lemont, Ill.:				
Sulfur plant, tons per day	15	Building		Graff Engineering Co.
Increase crude-oil capacity, bbl. per day	10,000	Building	Mid '53	
Increase cat cracking, bbl. per day	2,000	Building	Mid '53	
Increase desulfurization unit, bbl. per day	5,000	Building		
New alkylation unit, bbl. per day	1,500	Building		
Great Northern Oil Co., North Dakota:				
New refinery—				
Crude unit, bbl. per day	30,000	Authorized		
Cat cracker, bbl. per day	7,500	Authorized		
Alkylation unit, bbl. per day	2,500	Authorized		
Cat reformer, bbl. per day	6,000	Authorized		
Cat poly unit, bbl. per day	700	Authorized		
Great Southern Corp., Corpus Christi, Tex.:				
Cat reformer, bbl. per day	3,500	Building	1954	
Gulf Oil Corp., Philadelphia:				
Cat cracker, bbl. per day	63,000	Building	Mid '53	M. W. Kellogg Co.
Distillation unit, bbl. per day	125,000	Building	Early '53	
Cat reformer, bbl. per day	10,000	Planned	Mid '53	
Gasoline-sweetening unit, bbl. per day	40,000	Building	Mid '53	
Gulf Oil Corp., Cincinnati:				
Packaging and blending plant		Planned		
Hercules Powder Co., Gibbstown, N. J.:				
Petrochemical plant		Authorized		
Heyden Chemical Corp., Houston:				
Methanol plant		Authorized		
Humble Oil & Refining Co., Baytown, Tex.:				
Cat. poly unit		Planned		
Propane deasphalting unit, bbl. per day	28,000	Contracted	1954	M. W. Kellogg Co.
Husky Oil Co., Cody, Wyo.:				
Cat reformer, bbl. per day	1,000	Building	Mid '53	Grebe & Doremus
Vacuum unit		Building	Mid '53	Koch Engineering Co.
Imperial Oil Co., Ltd., Vancouver, B. C.:				
Expand refinery crude cap., bbl. per day		Building	Late '53	
Cat cracking unit, bbl. per day	7,600	Building	Late '53	
Imperial Oil Co., Ltd., Sarnia, Ont.:				
Distillation units, bbl. per day	46,500	Building	Early '53	
Cat cracker, bbl. per day	23,250	Building	Early '53	
Imperial Oil Co., Ltd., Regina, Sask.:				
Distillation unit, bbl. per day	8,100	Building	Early '54	
Cat cracker, bbl. per day	7,500	Building	Early '54	
International Refineries, Inc., Wrenshall, Minn.:				
New refinery—				
Crude unit, bbl. per day	11,500	Building	Mid '53	Lummus Co.
Cat cracker				
Jefferson Chemical Co., Port Neches, Tex.:				
Expand petrochemical plant		Building		
Kamloops Refinery Association, Kamloops, B. C.:				
New refinery—				
Crude unit, bbl. per day	2,500	Planned	1954	
Kanotex Refining Co., Arkansas City, Kans.:				
Expand refinery, bbl. per day	3,000	Planned		
Kerr-McGee Oil Industries, Wynnewood, Okla.:				
Additions and modifications to plant		Building		
Lakeside Refining Co., Kalamazoo, Mich.:				
Refinery expansion, bbl. per day	2,000	Building	Early '53	
Cat cracker, bbl. per day	2,000	Building	Mid '53	
Cat reformer		Building	Mid '53	

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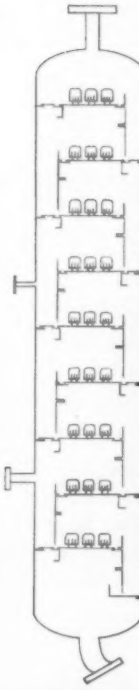

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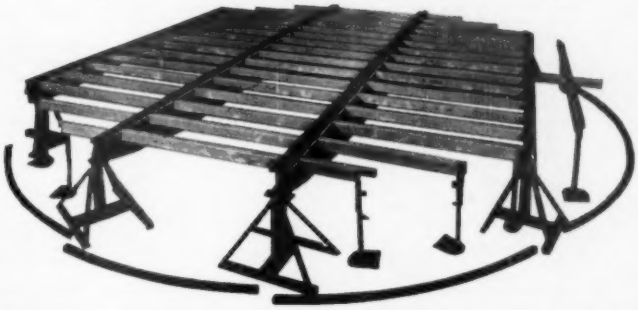

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Active Refinery-Building Projects (continued)

Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Leonard Refineries, Inc., Alma, Mich.:				
Increase crude-oil cap., bbl. per day	10,000	Building	1953	
Additions to cat cracker, bbl. per day	2,300	Building	1953	
Enlarge asphalt facilities, bbl. per day	700	Building	1953	
Increase L.P.G. capacity, bbl. per day	100	Building	1953	
Lion Oil Co., El Dorado, Ark.:				
Cat cracker, bbl. per day	10,000	Building	1954	
Alkylation unit, bbl. per day	1,000	Building		
Vapor-recovery unit, bbl. per day		Building		
McMurrey Refining Co., Tyler, Tex.:				
Cat reformer, bbl. per day	5,000	Building	1953	
Contact coker, bbl. per day	1,500	Building	1953	
Malco Refineries, Inc., Prewitt, N. M.:				
Expand crude cap., bbl. per day	3,500	Authorized		
Cat reformer		Contracted		Grebe & Doremus Process Co.
Cat poly		Authorized		
Expand thermal cracker		Authorized		
Mercury Oil Refining Co., Oklahoma City:				
Refinery expansion, bbl. per day	7,000	Building	Late '53	Refinery Engineering Co.
Cat cracker, bbl. per day	2,500	Building		
Poly unit		Building		
Midland Coop. Wholesale, Cushing, Okla.:				
Cat cracker, bbl. per day	4,000	Building	1953	
Visbreaker, bbl. per day	5,000	Building	1953	
Cat poly, bbl. per day	300	Building	1953	
Gas-concentration unit		Building	1953	
Monsanto Chemical Co., Avon, Calif.:				
Petrochemical plant		Building	Late '54	
Northwestern Refining Co., St. Paul Park, Minn.:				
Cat cracker, bbl. per day	5,000	Building	Early '53	Universal Oil Products Co. Procon, Inc.
Topping unit, bbl. per day	30,000	Authorized	1953	
Ohio Oil Co., Robinson, Ill.:				
Coking unit, bbl. per day	6,000	Building	1953	Lummus Co.
Alkylation unit, bbl. per day	1,500	Building	1953	
Cat reformer, bbl. per day	7,000	Building	1953	Catalytic Construction Co.
Pacific Oil & Refining Co., Seattle, Wash.:				
New refinery, bbl. per day	10,000	Planned		
Pan American Refining Corp., Texas City, Tex.:				
Cat cracker, bbl. per day	30,000	Building	1953	Lummus Co.
Cat poly unit, bbl. per day	800	Building	1953	Lummus Co.
Pan-Am Southern Corp., Destrehan, La.:				
Hydroformer, bbl. per day	2,000	Building		M. W. Kellogg Co.
Paragon Oil Co., Newark, N. J.:				
New refinery—				
Crude unit, bbl. per day	20,000	Planned	1954	
Cat cracker, bbl. per day	9,000			
Cat reformer, bbl. per day	4,000			
Peteo Corp., Marrero, La.:				
Refinery increase crude unit, bbl. per day	5,000	Building	Mid '53	
Cat cracker, bbl. per day	1,000	Authorized	1953	
Phillips Petroleum Co., Woods Cross, Utah:				
Expand cat cracker		Planned	1954	
Phoenix Refining Co., Inc., San Antonio:				
Reinstalling refinery, bbl. per day	3,000	Building		
Proven Oil & Refining Co., Florence, Ariz.:				
New refinery—				
Crude unit, bbl. per day	16,500	Planned		
Cat cracker, bbl. per day	8,500			
Alkylation, bbl. per day	700			
Pure Oil Co., Smiths Bluff, Tex.:				
Cat cracker, bbl. per day	17,000	Contracted	Early '53	M. W. Kellogg Co.
Cat poly unit		Contracted	Early '53	M. W. Kellogg Co.
Expand alkylation unit		Contracted	Early '53	M. W. Kellogg Co.
Tube still		Contracted	Early '53	
Pure Oil Co., Toledo:				
Cat cracker, bbl. per day	12,000	Contracted	Early '53	M. W. Kellogg Co.
Cat poly unit		Contracted	Early '53	M. W. Kellogg Co.
Refinery Operators, Ltd., Coleville, Sask.:				
Rehabilitate refinery, bbl. per day	5,000	Building	Early '53	
Republic Oil Refining Co., Texas City, Tex.:				
Platformer		Building	1953	Universal Oil Products Co.
Plant expansion		Building	1953	Universal Oil Products Co.
Richfield Oil Corp., Watson, Calif.:				
Increase crude-oil capacity, bbl. per day	20,000	Building	1954	
Vacuum unit, bbl. per day	60,000	Contracted	1954	C. F. Braun Co.
Cat cracker, bbl. per day	35,000	Contracted	1954	C. F. Braun Co.
Superfractionator		Contracted	1954	Fluor Corp., Ltd.
Revamp alkylation unit		Contracted	1954	Fluor Corp., Ltd.
Riverlake Oils, Ltd., Fort William, Ont.:				
New refinery—				
Crude unit, bbl. per day	4,000	Planned		
Salt Lake Refining Co., Salt Lake City:				
Vacuum unit, bbl. per day	9,500	Building		Bechtel Corp.
Shell Chemical Co., Houston:				
Ethyl chloride plant		Building		
Shell Chemical Co., Ventura, Calif.:				
Petrochemical plant, tons per day	150	Building	Mid '53	
Shell Oil Co., Wilmington, Calif.:				
Distillation facilities, bbl. per day	52,000	Building		

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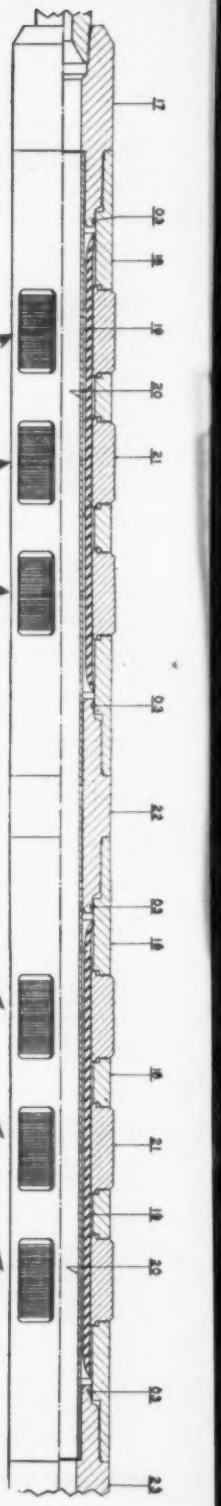

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Active Refinery - Building Projects (continued)

Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Shell Oil Co., Martinez, Calif.:				
Distillation facilities, bbl. per day	5,000	Building	.....	.....
Shell Oil Co., Wood River, Ill.:				
Platforming unit, bbl. per day	16,000	Building	.....	Procon
Shell Oil Co., Houston:				
Platforming unit, bbl. per day	16,000	Building	.....	Procon
Shell Oil Co. of Canada, Ltd., Montreal, Que.:				
Alcohol plant, tons per year	10,000	Building	.....	C. F. Braun Co.
Shell Oil Co. of Canada, Vancouver, B. C.:				
Increase crude-oil capacity, bbl. per day	7,000	Building	Late '53	.....
Cat cracker, bbl. per day	5,000	Building	Late '53	.....
Sinclair Refining Co., Wellsville, N. Y.:				
Propane-deasphalting unit, bbl. per day	700	Building	1953	Fluor Corp., Ltd.
Sinclair Refining Co., Houston:				
Cat cracker, bbl. per day	50,000	Building	Late '53	C. F. Braun Co.
Topping unit, bbl. per day	35,000	Building	Late '53	Fluor Corp., Ltd.
Vacuum unit	.....	Building	Late '53	.....
Standard Oil Co. of California, El Segundo, Calif.:				
Platformer, bbl. per day	10,000	Building	1953	Universal Oil Products Co.
Vacuum unit, bbl. per day	54,000	Building	1954	.....
Cat cracker, bbl. per day	36,000	Building	1954	.....
Standard Oil Co. of California, Richmond, Calif.:				
Vacuum unit, bbl. per day	52,000	Authorized	.....	.....
Cat cracker, bbl. per day	36,000	Authorized	.....	.....
Expand alkylation unit	.....	Authorized	.....	.....
Petrochemical facilities	.....	Contracted	1953	Stone & Webster
Standard Oil Co. (Ind.), Mandan, N. D.:				
New refinery—				
Crude unit, bbl. per day	30,000	Authorized	.....	.....
Standard Oil Co. (Ohio), Lima, Ohio:				
Platformer, bbl. per day	12,000	Authorized	.....	.....
Cat reformer, bbl. per day	15,000	Contracted	Early '54	Lummus Co.
Revamp crude-oil coker, bbl. per day	30,000	Contracted	Early '53	Lummus Co.
Standard Oil Co. (Ohio), Toledo:				
Alkylation unit, bbl. per day	3,000	Building	1953	.....
Stanolind Oil & Gas Co., Superior, La.:				
Hydroforming plant	.....	Considering	.....	.....
Sun Oil Co., Marcus Hook, Pa.:				
Houdriformer, bbl. per day	11,000	Building	.....	.....
Arosorb unit	.....	Building	.....	.....
Sun Oil Co., Sarnia, Ont.:				
New refinery—				
Crude unit, bbl. per day	15,000	Building	Late '53	.....
Suntide Refining Co., Corpus Christi, Tex.:				
New refinery—				
Crude unit, bbl. per day	30,000	Building	Late '53	Lummus Co.
Taylor O. & G. Co., Corpus Christi, Tex.:				
Aromatics facilities, bbl. per day	1,200	Planned	.....	.....
Taylor O. & G. Co., Port Isabel, Tex.:				
Propane and L.P.G. recovery facilities, bbl. per day	600	Planned	.....	.....
Texas City Refining, Inc., Texas City, Tex.:				
Houdriflow unit, bbl. per day	18,000	Building	Mid '53	.....
The Texas Co., Lockport, Ill.:				
Increase refinery capacity—				
Atmospheric-vacuum unit, bbl. per day	25,000	Planned	Early '54	.....
Furfural refining unit	.....	Planned	Early '54	.....
Solvent-dewaxing unit	.....	Planned	Early '54	.....
Contact filter plant	.....	Planned	Early '54	.....
Propane-deasphalting plant	.....	Planned	Early '54	.....
Percolation filter unit	.....	Planned	Early '54	.....
Compounding and packaging	.....	Planned	Early '54	.....
The Texas Co., El Paso, Tex.:				
Crude-oil unit, bbl. per day	4,000	Building	1953	.....
Cat cracker, bbl. per day	5,000	Building	1953	.....
The Texas Co., Amarillo, Tex.:				
Crude-oil unit, bbl. per day	6,500	Building	1953	.....
Cat cracker, bbl. per day	5,000	Building	1953	.....
Alkylation unit, bbl. per day	500	Building	1953	.....
Tide Water Associated Oil Co., Drumright, Okla.:				
Crude unit, bbl. per day	4,000	Building	Early '53	Born Engineering Co.
Union Oil Co. of California, Wilmington, Calif.:				
Vacuum unit, bbl. per day	38,500	Authorized	.....	.....
Topping units (2), bbl. per day	20,000	Authorized	.....	.....
Coking unit, bbl. per day	15,000	Authorized	.....	.....
Union Oil Co. of California, Rodeo, Calif.:				
Modernize asphalt plant, tons per day	780	Building	Late '53	Ehrhart & Arthur
United Refining Co., Warren, Pa.:				
Cat reformer, bbl. per day	2,500	Building	Mid '53	Blaw-Knox
Vickers Petroleum Co., Inc., Potwin, Kans.:				
Increase refinery, bbl. per day	4,000	Building	1953	.....
Cat cracker	.....	Building	Mid '53	Southwest Engineering Co.
Wesco Refining Co., Rangely, Colo.:				
Cracking unit, bbl. per day	1,250	Planned	1953	.....
Williston Refining Co., North Dakota:				
New refinery—				
Crude unit, bbl. per day	10,000	Planned	.....	.....
Wood River Oil & Refining Co., Calumet City, Ill.:				
New refinery—				
Crude unit, bbl. per day	15,000	Planned	.....	.....
Cat cracker, bbl. per day	6,800	Planned	.....	.....

Field-Processing Capacity Due for Large Increase

by R. B. Tuttle

MORE than half of the new-plant projects reported to The Oil and Gas Journal for 1953 are yet to be started. At mid-January, the number of new field processing plants totaled 42. This included four Canadian projects.

Plant construction now under way in the United States, and scheduled for completion in 1953, involves 15 new installations. Six of these new projects are natural-gasoline plants, five are petrochemical installations, three are sulfur-conversion plants, and one is a carbon-black installation. Also scheduled for the same completion period are two projects, one petrochemical and one gasoline plant, which have only recently been contracted.

As of middle of January, there are 42 major field processing plant projects yet to be contracted. Only one of these, a petrochemical plant, is scheduled for Canada.

In the United States, six major plant projects are on authorized status. Construction of these plants is expected to start within the first quarter of 1953. Another group of major United States plants are now in various stages of planning. Natural-gasoline and cycling plants make up 60 per cent of this group, with nine projects. New petrochemical plants account for four more new projects still in the planning stage, along with one new sulfur-conversion plant.

Natural-Gas Processing-Plant Projects

Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Allied Chemical & Dye Corp., Omaha:				
Petrochemical plant		Authorized		
Amerada Petroleum Corp., Williston area:				
Natural-gasoline plant		Planned		
American Cyanamid Co., Jefferson Parish, Louisiana:				
Petrochemical plant		Contracted		Chemical Construction Corp.; J. A. Jones Construction Co.
J. R. Butler Interests, Howard County, Texas:				
New natural-gasoline plant		Planned		
Cabot Carbon of Canada, Ltd., Sarnia, Ont.:				
Carbon-black plant		Building	1953	
Campbell Absorption Plant, Ltd., Alberta, Canada:				
New natural-gasoline plant		Planned		
Canadian Chemical Co., Edmonton, Alta.:				
Petrochemical plant		Building	Mid '53	
Canadian Industries, Inc., Edmonton, Alta.:				
Petrochemical plant		Planned		
Carbide & Carbon Chemicals Div., Texas City, Tex.:				
Petrochemical plant		Planned		
Carbide & Carbon Chemicals Div., Seadrift, Tex.:				
Petrochemical plant		Planned		
Central Petroleum Co., Coyle, Okla.:				
New gasoline plant		Authorized		
Cities Service Oil Co. (Del.), Blackwell, Okla.:				
New natural-gasoline plant, cu. ft. per day	190,000,000	Building	Early '53	
Cities Service Oil Co. (Del.), Houma, La.:				
Natural-gasoline plant, cu. ft. per day	50,000,000	Planned		
Commercial Solvents Corp., Sterlington, La.:				
Petrochemical plant		Authorized		
Consolidated Chemical Industries, Inc., Houston:				
Plant expansion		Building		
Continental Oil Co., Johnson County, Wyoming:				
New gasoline and repressure plant, gal. per day	4,200	Building	Early '53	
Deere & Co., Pryor, Okla.:				
Petrochemical plant		Authorized	1954	
Delta Chemical Co., Pointe a la Hache, La.:				
Petrochemical plant		Planned		
General Chemical Corp., Monument, N. M.:				
Sulfur-conversion plant		Building		
General Crude Oil Co., Kent County, Texas:				
Extraction plant		Planned		
General Petroleum Corp., Manderson field, Wyoming:				
Sulfur plant, tons per day	50	Authorized		
Goodrich-Gulf Chemicals, Inc., Orange, Tex.:				
Petrochemical plant		Planned		
Gulf Oil Corp., St. Landry Parish, Louisiana:				
New cycling plant, cu. ft. per day	25,000,000	Planned		
Honolulu Oil Corp., Hockley County, Texas:				
New gasoline plant, cu. ft. per day	1,500,000	Building	Early '53	Hudson Engineering Corp.
Hugoton Production Co., Ulysses, Kans.:				
Increase plant capacity, gal. per day	90,000	Building		
Humble Oil & Refining Co., Hopkins County, Texas:				
Plant expansion		Building	1953	Stearns-Roger Mfg. Co.
Imperial Sulfur & Acid Co., San Juan basin, New Mexico:				
Sulfur plant, tons per day	60	Planned		
Jergins Oil Co. of Texas, DeWitt, Tex.:				
Compressor-stripper plant		Authorized		
Leduc Southern Absorption, Ltd., Canada:				
New gasoline plant, cu. ft. per day	1,500,000	Contracted		Blaw-Knox Construction Co.
Lion Oil Co., Emory, Tex.:				
Sulfur plant		Building		
Lion Oil Co., Luling, La.:				
Petrochemical plant, tons daily	300	Building	1954	Lummus Co.
Lone Star Gas Co., Parker County, Texas:				
New natural-gasoline plant	25,000	Planned		

Natural-Gas Processing-Plant Projects (continued)

Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Lone Star Producing Co., Upton County, Texas:				
New natural-gasoline plant		Planned		
Lone Star Producing Co., Runnels County, Texas:				
New natural-gasoline plant, cu. ft. per day	30,000,000	Building		Gasoline Plant Const. Co.
Long Beach Oil Dev. Co., Long Beach, Calif.:				
Injection-storage plant		Contracted	Early '53	Oil Field Construction Co.
National Petro-Chemicals Corp., Tuscola, Ill.:				
Alcohol plant		Building		
Pecos Petroleum Co., Pecos, Tex.:				
Plant increase, gal. per day	22,000	Building		
Phillips Chemical Co., Pasadena, Tex.:				
New ammonia-methanol-acetylene plant		Building	Early '53	Chemical Construction Co.
Phillips Petroleum Co., Ector County, Texas:				
Plant increase, cu. ft. per day	75,000,000	Contracted	Early '53	
Phillips Petroleum Co., Upton County, Texas:				
New gasoline plant, cu. ft. per day	60,000,000	Contracted	Mid '53	
Plant extension, cu. ft. per day	55,000,000	Contracted	Mid '53	
Reef Fields Gasoline Corp., Sweetwater, Tex.:				
New gasoline plant, cu. ft. per day	33,750,000	Building	1953	
Royalite Oil Co., Ltd., Turner Valley, Alberta:				
Sulfur plant, tons per day	30	Contracted		Foster Wheeler, Ltd.
Runnels Gas Prod. Corp., Runnels County, Texas:				
New gasoline plant				
Sherritt-Gordon Mines, Ft. Saskatchewan, Canada:				
Petrochemical plant		Building	1954	
Sid Richardson Gasoline Co., Pointe a la Hache, La.:				
Petrochemical plant		Planned		
Southern Production Co., Brazoria County, Texas:				
New gasoline plant, cu. ft. per day	191,000,000	Authorized	Early '54	
Spencer Chemical Co., Vicksburg, Miss.:				
Petrochemical plant, tons per day	200	Building		
Additional facilities		Contracted		Air Products, Inc.
Stanolind Oil & Gas Co., Andrews County, Texas:				
Injection and gasoline plant, cu. ft. per day	20,000,000	Building	Early '53	Hudson Engineering Corp.
Stanolind Oil & Gas Co., Ector County, Texas:				
Sulfur-conversion unit, tons per day	17	Building	Early '53	Girdler Corp.
Sterling Oil of Oklahoma, Inc., Garvin County, Oklahoma:				
New gasoline plant, cu. ft. per day	25,000,000	Planned		
Texas Eastman Co., Longview, Tex.:				
Plant addition		Planned		
West Texas Gas Co., Fritch, Tex.:				
Increase plant, gal. per day	21,200	Building		
Wilmington Gasoline Co., Wilmington, Calif.:				
Plant increase, gal. per day	11,000	Planned		

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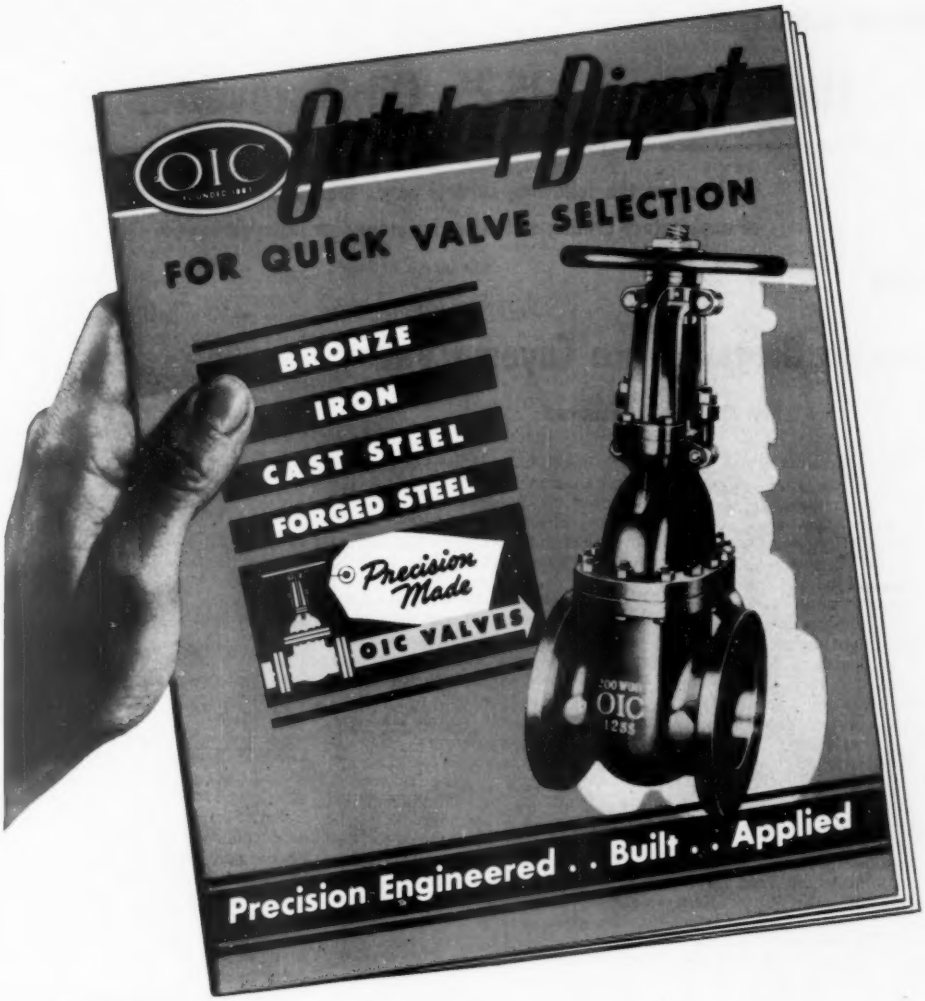

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Highlights on 1952's Oil Discoveries

On this and the following several pages are summaries of exploratory drilling activities, by areas, for last year

CALIFORNIA

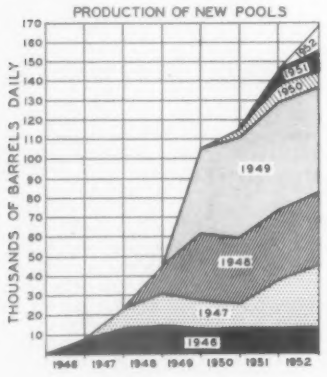
Discoveries Biggest Since Cuyama Valley

by D. H. Stormont

CALIFORNIA operators drilled more exploratory tests and a greater amount of footage than ever before. New oil reserves uncovered by this record-breaking effort were not spectacular but far exceeded those discovered in each of the previous 2 years.

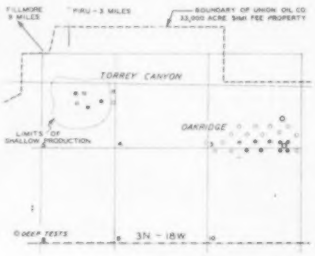
Exploration was rather well confined to the principal oil-producing counties; however, because of the more intensive search for gas northern San Joaquin and Sacramento Valley counties received many more tests than in 1951.

The 72 successful oil tests completed during the year yielded 6 new fields and 66 new pools in old fields. Of the new fields Oakridge in Ventura County showed the most promise of being of substantial importance. Jesus Maria, Santa Barbara County, is believed to have excellent prospects for becoming an important heavy-oil field. New deep pools at Wheeler Ridge, Kern County, and at Torrey Canyon, Ventura County, appeared to be the most important of the successful new-pool wildcats.



The search for new gas supplies was about as unrewarding as was experienced in previous recent years. Only two new fields were found, Freeport in Sacramento County and Sutters Buttes in Sutter County.

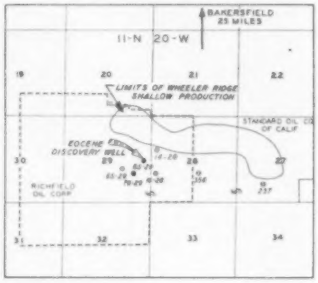
Oakridge-Torrey Canyon . . . Among the top discoveries of the year were Torrey Canyon and nearby Oakridge in the Santa Clara Valley. Both were made by Union Oil Co.



The lower Sespe pay discovered last April is of importance because of the zone's spectacular thickness and the anticipated high per-well recoveries. It appears the net oil sand thickness of the lower Sespe, which produces crude of about 20° gravity; is approximately 2,000 ft. Union estimates the oil yield of the zone conservatively at 100,000 bbl. per acre. A substantial additional yield is expected from the Sespe-Eocene zone. Size and shape of the deep structure are yet to be determined. It is believed to be anticlinal, complicated by faulting. In the belief that high-gravity, flowing production may be found even deeper on the structure, Union has started a 13,000-15,000-ft. wildcat.

At Oakridge field Union had completed eight producers, most of which found about 250 ft. of oil sand in being drilled to approximately 3,000 ft. Currently two rigs are being used in development work with a third rig at work on deeper possibilities.

Wheeler Ridge find . . . Richfield Oil Corp. in April made an important discovery at the old Wheeler Ridge field on the southeast end of San Joaquin



Valley. Prolific, high-pressure crude production was established in a new Eocene pool which is expected to be of substantial proportions. In addition, formation tests have shown the existence of a shallower Miocene pay.

Completion of the discovery well as a 1,170-bbl. 35°-gravity crude producer in an Eocene sand at 9,700 ft. was of special significance since it established the productivity of this pay in the southern portion of the valley. Prior Eocene production was some 40 miles to the northwest.

In drilling the Eocene discovery, high pressure encountered at about 6,300 ft. caused the operator to suspect a shallower Miocene pay. The second well tested the formation for 1,114 bbl. of 44°-gravity oil through a ½-in. choke.

Buena Vista Hills . . . A discovery holding promise but not fully evaluated was that of Standard Oil Co. of California in a Miocene fractured shale at Buena Vista Hills, west side San Joaquin Valley. The new deeper pay, designated Antelope pool, is stratigraphical-

ly equivalent to the Stevens zone which produces in fields east of Buena Vista Hills. The discovery well was drilled on the southern (Honolulu) of two closed anticlinal structures. It was completed in March flowing 200 bbl. daily through perforations at 3,525-4,398 ft.

The discovery's status at the year's end was that Antelope shale production was established over approximately 2,000 acres on the Honolulu anticline and at the one well on the United structure. Whether it will be productive throughout the intervening saddle area, as are the shallower Pliocene pays, is yet to be determined.

Potential major discovery . . . Union Oil Co. in September, made a heavy-oil discovery near Lompoc, Santa Barbara County, which could be of substantial proportions. The discovery well, 4 Jesus Maria, was completed in a chert zone of the Monterey (middle Miocene) at 3,394-3,755 ft. pumping 302 bbl. of 9°-gravity oil daily.

Completion of a deep-zone test in the Carneros (lower Miocene) zone at Elk Hills added a new condensate pool to that field's huge emergency reserves. The zone is thought to exist over much of the Elk Hills structure.

Other highlights . . . Vaqueros sand (lower Miocene) production was added in May at the unitized Coalinga Nose field, Fresno County. New field discoveries were recorded by Richfield at Los Lobos in southern San Joaquin Valley and at Turk anticline in Fresno County.

Other oil discoveries were largely in new fault blocks or deeper pools at old fields. One such discovery was Superior Oil Co. 1 Government which added a new Etchegoin pool on the northeast flank of the old Lost Hills field, Kern County.

Offshore wildcat . . . A highly significant development of the year was the beginning of construction on a filled drilling island 1½ miles offshore from Seal Beach. The operation was being carried on by Monterey Oil Co. with The Texas Co. a partner. Completion of the island has been halted by litigation so that actual drilling may not get under way until midyear. It is generally thought that several of the zones productive at Wilmington will extend this far southeast.

Development highlights . . . Development drilling was carried on at practically the same level as in 1951 with the state's old fields receiving the bulk of the activity. Cuyama Valley fields which were the most active in the preceding 3 years, however, received but little drilling.

One of the most active fields was San Ardo in Monterey County. About 120 producers were added to increase the total to 330 and to raise the field's output 10,000 bbl. to 25,000 bbl. daily. This activity resulted in the field's two pays being almost completely developed on 10-acre spacing. Because of a severe water-coning problem and the high viscosity of the low-gravity crude, it is likely the field eventually will be drilled down to 5-acre spacing.

ROCKY MOUNTAINS

Exploration Activity High Throughout Most of Area

INCREASED exploration for oil was the keynote of activities in the Rocky Mountain region during 1952.

The volume of geologic and geophysical work more than doubled that of any previous year in the majority of those states. Geophysical activity in the Williston basin alone exceeded the work done in all mountain states in 1951. The number of wildcats drilled and discoveries made was greater during 1952 than in any other year in the history of oil activity in the region.

Although development drilling also increased during the year, production for the Rocky Mountains barely exceeded that for the previous year due to lack of market outlet. At the end of 1952 this situation was changed, and there was promise of additional pipeline construction further to extend market areas for Rocky Mountain crude oil and refined products. The Platte Pipe Line, first major line from the region since 1924, was completed in November 1952. Starting with a throughput of approximately 50,000 bbl. daily the line has a planned take of nearly 100,000 bbl. of crude daily during 1953. The majority of this oil is to come from Wyoming, Colorado, and western Nebraska fields.

There was less lease acquisition during 1952 in the Rocky Mountain states than in the preceding 3 years. This was considered normal since during the years 1948-1951 lease plays were extremely extensive. The year 1952 was one of more processing of areas and evaluation of prospects.

Julesburg Basin

For the first time in the history of oil searching in the region there were more wildcats drilled in Colorado than there were in Wyoming. This was accounted for by activity through the Denver-Julesburg basin, which reached a new high. Of the wildcats drilled, a number were located without benefit of geophysical work to evaluate acreage blocks. However, the percentage of success still remained high.

The pattern of discoveries through the Denver-Julesburg basin of northeastern Colorado and western Nebraska continued as in previous years, with a few of the pools discovered apparently offering sizable reserves, a larger percentage indicating medium size, and several apparently one-well pools. All commercial discoveries were in the Dakota sands, where discovery was first made on the east side of this basin in 1949. There were more than 40 new pools or new pays discovered in the general trend through Cheyenne and Kimball counties, Nebraska, southwestward into Logan, Morgan, Weld, Adams, and Washington counties, Colorado.

Of interest in this general play were further extensions from the previous "trend" area in Cheyenne and Logan counties. A discovery was made in the Hart area of southern Morrill County, moving the play farther northward in the basin and making that county oil productive for the first time. Additional gas discoveries were made southwest of Sidney, Cheyenne County, indicating a probable sizable gas reserve through this general area.

The majority of discoveries in the western Nebraska portion of the basin were again made by Ohio Oil Co., which has most of the leased acreage in the county. A number of independents did considerable exploratory drilling in the state and had resultant discoveries.

In the Colorado portion of the basin exploratory drilling extended the general producing fields southeastward and westward in the basin. Amerada Petroleum Corp. started a wildcat drilling program, both through farmouts and in its own name, on large lease holdings through Washington County. This resulted at the end of the year in two new discoveries with additional drilling under way. R. L. and J. L. Rush of Denver and Fort Worth made a discovery in the Rush Willadel area, and Southern Production Co. had its first Denver-Julesburg production with completion of a gas discovery in the Mott area, both in Washington County. The majority of development drilling was still confined to the known pools in Logan, Morgan, and Weld counties, partially due to the fact that pipe-line outlet was under construction from these areas at the end of the year. Production throughout the en-

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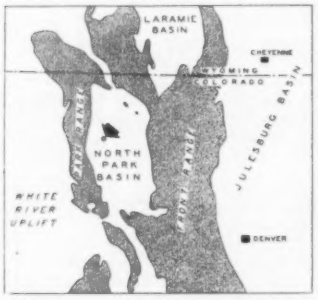
tire basin was curtailed due to lack of market and pipe-line outlet, but with completion of the Platte line this picture changed to one of a ready market for all crude that could be produced.

Las Animas arch . . . Although not of commercial status, the completion of a small gas discovery in the Morrow formation along the Las Animas arch of East Central Colorado, may be of great importance for future drilling through this area. Continental Oil Co. 1 McClave, 11-20s-49w, in Southwest Eads area, Kiowa County, was completed for an initial of 357,000 cu. ft. of gas daily from the zone 4,870-90 ft., following a nitroglycerin shot. The well is shut in pending future drilling and market arrangements. Although a large number of the wildcats through this general area of the state have had both oil and gas shows, this is the first well in Colorado to be completed in zones below the Cretaceous, even though it is of semicommercial value. Additional exploratory drilling is expected through the southern portion of the Denver-Julesburg basin, along the Las Animas arch and in the northwestern portion of the Anadarko basin, as a result of this discovery.

North Park basin . . . Northwestern Colorado attracted additional attention during 1952, although there were no important completions during the year. In the North Park area, Jackson County, M. E. Davis (Benedum-Trees) had not officially completed their Coalmont



anticline discovery. This well flowed oil on initial tests of the Frontier formation, and attracted a great deal of attention at that time. However, the operator had some difficulty after casing was cemented in getting a completion gage as the well did not flow, and pump was being installed.

Wyoming Basins

Each of the basins of Wyoming had its exploratory drilling campaign during 1952, with the results equally high with previous records. In the Powder River basin there were no large pool discoveries similar to Sussex-Meadow Creek in the previous years. However, production was moved northward in the basin with a Shannon sand discovery in Ash Creek area, Sheridan County, on the northwest side of the basin in Wyoming. This discovery, immediately south of the Montana state line and more than 60 miles north of the closest production, pumped an initial of 200 bbl. of oil daily from the zone 4,715-50 ft., and development drilling continued through the year.

There was a Tensleep discovery at Meadow Creek, Johnson County, following a similar discovery the year before at Sussex. Both discoveries are rated of major reserve importance for the area. Continental Oil Co. found a new producing area in West Sussex field, indicating increased reserves for that field. Tensleep production was established in the Teapot Naval Reserve, southeast of Salt Creek field, Natrona County, for the first activity in the reserve in many years. Both development and exploratory drilling continued for the south and southwest sides of this basin, with no major discoveries resulting.

In the Big Horn Basin, Gulf Oil Corp. 1 Stockham-Federal, 2-46n-94w, on Southwest Worland prospect, made a Phosphoria discovery for probably the major discovery of the year in this basin. The well had an initial of 572 bbl. of 45°-gravity distillate with 12,000,000 cu. ft. of gas daily through 52/64-in. choke, from Phosphoria at around 13,000 ft. The wildcat is located southwest of Worland field which produces high-gravity oil from the same formation. Although there was no additional development drilling in the field during the year, this is considered to represent a sizable reserve of gas and oil for this area. Market arrangements will follow planning for processing plants for the gas and oil, and additional drilling.

A similar discovery was made by Husky Oil-Wilshire Oil in Five Mile area, northwest of Worland in the central basin area, but stepout drilling has failed to show the large producing area hoped for and evaluation as to reserve is difficult under the present situation. Other discoveries in the Big Horn Basin were of less apparent size. Trigood Oil Co. made a small gas-distillate discovery in the Greybull sand at West Greybull, Big Horn County. Resolute Oil Co. made a new-pay Dakota sand discovery at Badger Basin, Park County, but with continued testing production dropped rapidly. Shell Oil Co. made a Tensleep discovery at West Sage Creek, Park County, with the well completed for a pumping gage of 75 bbl. of 22°-gravity oil daily.

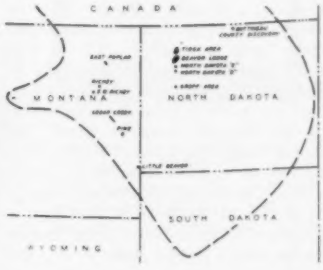
Green River basin . . . A development in southwestern Wyoming may be of great importance for future developments, although there was so little development during the year that it is difficult to estimate specific values. There has been Tertiary gas and some oil production from the Hiawatha-Powder Wash fields along the Colorado-Wyoming line in the southern Green River basin for years. However, this year Mountain Fuel Supply Co. made a gas discovery in the Mesaverde, which has not represented sizable reserves in the Wyoming area in previous drilling.

The Mesaverde is productive of gas throughout the San Juan basin, however, and discovery in the Green River basin is considered of interest. The well, 1 Trail Unit, 9-13n-100w, flowed an initial of 4,260,000 cu. ft. of gas daily from the zone 7,530-68 ft. Stanolind Oil & Gas Co. completed a Mesaverde oil discovery at nearby Middle Mountain, 10-12n-103w, for additional interest in the formation.

Williston Basin

In Montana, principal interest continued in the Williston basin, with a large number of exploratory wells drilled in this area. An Ordovician discovery was drilled by Shell Oil Co. at 1 Little Beaver, 13-4n-61e, Fallon County, along the southeast tip of the Cedar Creek anticline. The Texas Co.'s exploratory drilling program was continued along the north end of this anticline, resulting in discoveries of Sand Creek, Glendive, and Deer Creek in Dawson County.

Shell Oil Co. made a new Devonian discovery in the Southwest Richey area at 21-33-B-NPRR, 33-22n-48e, 16



miles southwest of the first Williston basin discovery in northeastern Montana. This well flowed 177 bbl. of oil daily through 7/64-in. choke through casing perforations at 9,090-9,145 ft. and open hole to 9,260 ft. In East Poplar area, Roosevelt County, C. H. Murphy, Jr., made two Charles-Madison discoveries during the year, with the 10 Unit, 30-29n-51e, northwest of East Poplar field proper.

Development drilling was continued during the year, and a sizable producing area was indicated in this field—the largest to be semidefined at the present date in the Montana portion of the basin. At the end of the year Continental Oil Co. completed a small discovery in western Roosevelt County, with the well shut in pending further work in the area.

Other Montana areas . . . In Central Montana the Northwest Sumatra area, Rosebud County, was extended by several wells, with some having high initials. Drilling indicated that this might be the most successful of the series of lower Amsden pools to be found in this area. East of Billings in the Hardin area George J. Greer, Trustee, made a Tensleep discovery in Snyder field, 6-1s-35e, Big Horn County, and additional interest is being shown in this portion of the state.

North Dakota . . . Efforts to find production along the east side of the Williston basin in North Dakota failed to a certain extent with several operators drilling wildcat failures. However, at the end of the year there was indication that a new producing area might be established in northern Bottineau County, immediately south of the Manitoba line.

Oil was found in Madison in several wells, although there was no commercial completions during 1952. However, along the general Nesson anticline, where both Beaver Lodge and Tioga were discovered by Amerada Petroleum Corp. in 1951, Amerada this year made three additional discoveries. In the Croff area, McKenzie County, 1 Binhomer-Risser, 12-149n-96w, was completed as a Madison producer after going to 13,773 ft., total depth. The well flowed 70 bbl. of oil with 14 bbl. of water through ½-in. choke in 6 hours from the zone 9,515-70 ft. Midway between Croff and Beaver Lodge the 1 North Dakota "D," 16-153n-95w, was completed flowing 127 bbl. of oil with some water through ½-in. choke daily from Madison at 8,998-9,042 ft. In the South Beaver Lodge area 1 North Dakota "E," 16-154n-95w, made a new producing Madison area pumping 50 bbl. of oil with an equal amount of water daily. Development drilling in both Tioga and Beaver Lodge moved throughout the year at a rapid rate with 80 wells now producing in these fields.

Uinta Basin

At ention in Utah again focused on the Uinta basin and several Tertiary discoveries were recorded for the year 1952. However, the discovery rate was comparatively low and the cost of drilling continued high for this wildcat area. Carter Oil Co. made a discovery in Flat Mesa area, Duchesne County at 1 Joseph Smith, 16-3s-5w (Uinta Special Meridian). This well produced from the basal Green River at 8,820-60 ft., flowing 273 bbl. of oil through ¼-in. choke daily. Carter Oil's Walker Hollow discovery, 1 Johnson, 8-7s-24e (Salt Lake Meridian), Uintah County, is northeast of Red Wash field and apparently opened a more economic development than in the deeper area of the basin. This well pumped 189 bbl. of oil in 23 hours from zones at 5,520-5,626 ft., with production also from the basal Green River. A small producer was completed in South Myton area, Duchesne County, by Deep Well Production. Development drilling in the Clear Creek area, Carbon County, assured a sizable gas reserve for the new pipe line into Salt Lake City. At Gordon Creek, Carbon County, Pacific Western Oil Co. found a small amount of Ferron sand gas from the zone 3,416-3,516 ft., and may do additional drilling.

San Juan Basin

In the San Juan basin there was continued gas development and extension through the very large Blanco-LaPlata areas of San Juan County. Wildcat drilling on the east side of the basin indicated additional gas through western Rio Arriba County, however, there was no important oil discovery for the year. Stanolind Oil & Gas Co. made a Mississippian discovery in old Hogback field, San Juan County, with well 13 USG, 19-29n-16w, completed flowing 146 bbl. of 70°-gravity oil and 15,000,000 cu. ft. of noninflammable gas daily. However, water broke in and it will be necessary to rework the well prior to sustained production.

With more than 750 wildcat wells drilled in the Rocky Mountains during 1952, far exceeding the record for any previous year in the history of the region, it still appears that the outlook for both drilling and discoveries will be high during the coming years. Large acreage spreads, in undrilled areas, remain to be evaluated and tested. Whole counties where there has been no previous drilling are now being evaluated with seismograph and geologic methods, indicating additional drilling.

The majority of operators indicate increased budgets for exploration in the Rocky Mountains. This is partially forecast by the establishment of new divisions of major companies in the Williston basin, and by the movement of new operators to the region. Early estimates indicate that more than 1,000 wildcat wells and 2,000 development wells will be drilled in the Rocky Mountains during the coming year.

SOUTHEAST NEW MEXICO

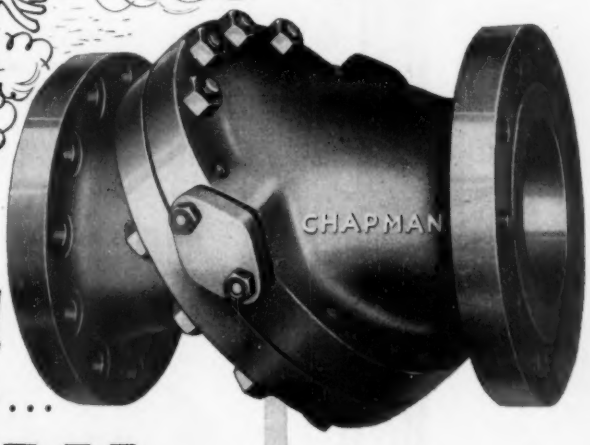
Many Pre-Permian Strikes Made in Lea County

By Carl F. Hoot

SOUTHEAST New Mexico accounted for something of a record in deep discoveries, extensions, and new pays for old areas in 1952. While operators generally are watching progress of wildcats in the unexplored areas of Chaves and Eddy counties for signs of new fields to come, many turned their efforts to developing new pools within the partially developed areas of northern Lea County.

In Lea County, ranging northward along the Chaves-Lea county line, and on the east along the Lea County-Texas state line, 21 wildcats were successfully completed in deep pre-Permian beds for significant reserves.

Exploratory drilling in this area during the year also added considerable reserves at lesser depths in the Clear



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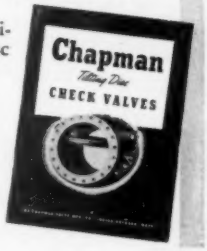

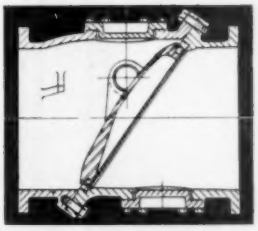

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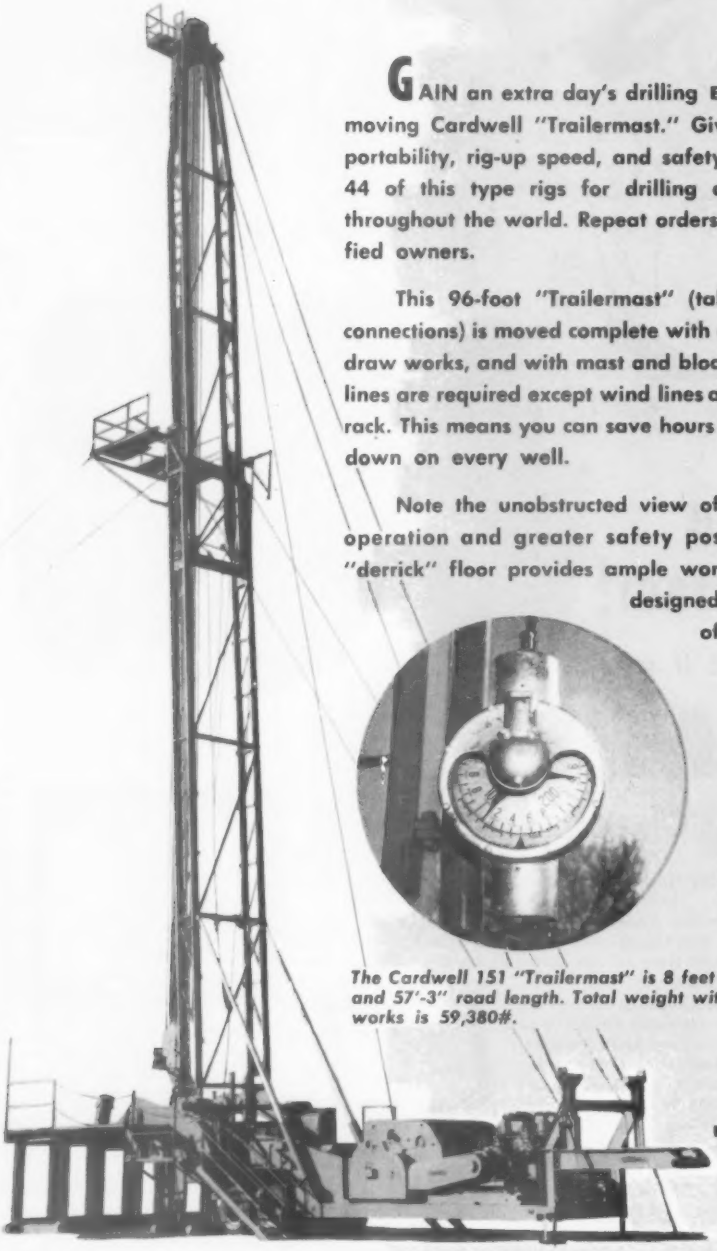

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Fork and Wolfcamp formations of lower Permian age. Several successful wildcats were completed in the transition zone between the Permian and the Pennsylvanian rocks.

Early in the year, Buffalo Oil Co. 12-B Baish (1 on map) in the old Maljamar field of Lea County, proved that Devonian oil is not confined to the northern areas. The well is located 20 miles southwest of nearest Devonian production at Saunders. Original completion at 13,557-68 ft. was for 578 bbl. of oil. Total depth was 13,573 ft. There was some water with the oil, which later increased and in October the hole was deepened to 13,626 ft. and recompleted for 160 bbl. of oil. Gravity of the deep oil was 47° and the gas-oil ratio was very low.

Buffalo has reworked the area with seismograph and new data indicate the well may be on the flank of a big structure. A confirmation well situated higher on structure is planned.

In the southeast corner of Lea County, Sun Oil Co. 1 Harper (2 on map) drilled into the Bone Springs formation at 8,690 ft., and at year's end was drilling shale and lime below 12,700 ft., still in the Permian and possibly still in the Wolfcamp. Drill-stem tests around 11,665 ft. recovered some 40°-gravity oil, and swabbing produced as high as 44 bbl. of oil in 11 hours with no water. However, the well would not flow and operators decided to drill ahead to about 14,000 ft.

Drilling for pre-Permian oil in the Delaware basin was under way at four widely separated points at year's end but the answer to possible deep production had not been found yet. This area, which has produced a little oil from sands in the top of the Permian-Delaware Mountain group, has such a thick Permian section that costs of drilling to older rocks present an economic barrier.

Pre-Permian discoveries completed in Southeast New Mexico during the year included the following: Amerada Petroleum Corp. 1 Fred Turner, 17-20s-38e (3 on map) added middle Ordovician-McKee sand production to Skaggs-Wolfcamp field. Potential was 827 bbl. daily.

Amon Carter 1-D Hill, 34-23s-37e (4 on map) between Teague and Fowler sections of the Langlie-Mattix trend, added Devonian production to a new Simpson and Ellenburger pool. Potential was 823 bbl. daily.

Continental Oil Co. 1-A Mary Wantz, 21-21s-37 (5 on map) added a new pay in Devonian to Brunson-Ellenburger field. Potential was 524 bbl. Total depth of 8,370 ft. did not explore the Ellenburger.

Amerada 1 Mary Raley (6 on map) extended McKee sand production north of its 1 Turner; ran approximately 100 ft. low to the discovery but was completed for 594 bbl. daily.

Jackson, Douglas & Ritchie 1 State, 27-10s-32e (7 on map) 8 miles northwest of Bagley - Pennsylvanian field, was completed for 240 bbl. daily from Pennsylvanian limestone at 8,390-8,664 ft.

Phillips Petroleum Co. 1-B Pello, 20-14s-32e (8 on map) flowed 178 bbl. daily from Permo-Pennsylvanian rocks at 9,554-76 ft.

Skelly Oil Co. 2-L Mexico, 5-25s-38e (9 on map) drilled to the Ellenburger at 10,578 ft. but plugged back for completion in the Fusselman at 8,630-8,730 ft. Potential was 1,073 bbl. daily.

L. F. Elliott 1-H Elliott-Federal, 31-24s-38e (10 on map) northwest extension to West Dollarhide field, completed in the Fusselman at 8,577-8,604 ft. Potential was 490 bbl. daily on gas lift.

The Texas Co. 1 Moore, 25-11s-32e (11 on map) Devonian discovery at 10,451-75 ft., flowed 2,404 bbl. on potential test.

The Texas Co. 1 Penny-Federal, 5-25s-38e, (12 on map) south offset to a Fusselman extension of Dollarhide multipay field, found Devonian pay at 8,175-8,390 ft. and completed for 611

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bbl. daily. This well ran low on the Fusselman and had no shows in that section.

Humble Oil & Refining Co. 1 Federal-Elliott, 1-16s-34e, (13 on map) a gas-distillate discovery in the Strawn at 12,880-910 ft., produced 256 bbl. of oil plus 4,540,000 cu. ft. of gas. Lowest formation tested was the Devonian at 14,685 ft.

The Texas Co. 1-AW State, NCT-2, 21-10s-37e (14 on map) 2½-miles northeast extension to Echols field, flowed 899 bbl. daily from Devonian pay at 12,057-73 ft.

The Texas Co. 1-BN, NCT-1, 25-11s-32e (15 on map) completed in the Mississippian at 9,654-9,710 ft. for 72 bbl. daily.

Tide Water Associated Oil Co. 1 Monteith, 20-16s-37e (16 on map) Strawn discovery at 11,256-80 ft., made potential of 754 bbl. daily. Lowest marker was Mississippian at 11,912 ft.

Amon Carter 1-M Hill-Federal, 34-23s-37e (17 on map) a south offset to the firm's 1-D Hill (Devonian discovery), found the Devonian about flat with the discovery but had no shows on drill-stem tests. Operators plugged back and completed as a McKee sand discovery at 9,110-9,290 ft. for 1,104 bbl. daily.

Amerada 1 Allie M. Lee, 23-11s-32e (18 on map) Devonian extension well, ran 283 ft. low on that formation to the Texas 1 Moore discovery but was completed for 269 bbl. daily.

The Texas Co. 1-BA State, 14-12s-32e (19 on map) opened Pennsylvanian-Bend pay in East Caprock field. Potential was 949 bbl. daily from 10,052-84 ft.

The Texas Co. 1-BJ State, 26-11s-32e (20 on map) west extension and new pay discovery in a new area, flowed 156 bbl. daily with high gas-oil ratio from Bend perforations at 9,736-9,840 ft.

Gulf Oil Corp. 1-AN State, 27-13s-33e (21 on map) Permo-Pennsylvanian discovery, or extension, northwest of North Saunders field, flowed 998 bbl. a day from pay at 9,588-9,625 ft. Deepest formation tested was the Devonian at 13,372 ft. which had no shows.

Cities Production Co. 1-AD State, 22-10s-32e (22 on map) northwest extension and new pay discovery in Mescalero-Pennsylvanian field, completed for 2,174 bbl. daily from Devonian pay at 9,808-9,13 ft.

Lawton Oil Corp. 2 State-Gulf 10-13s-33e (23 on map) completed as a gas-distillate discovery from the lower Pennsylvanian at 11,340-380 ft., for 1,320,000 cu. ft. of gas plus 112 bbl. of 53°-gravity oil.

Many of these wells may be classed as extensions, but geologists generally agree that any well projected to 10,000-12,000 ft. in the area of these discoveries is a wildcat while drilling is in progress. The Devonian, especially, has been found twisted and distorted with extremely steep dips.

WEST TEXAS

Record Drilling Fails to Prove a Truly Major Field

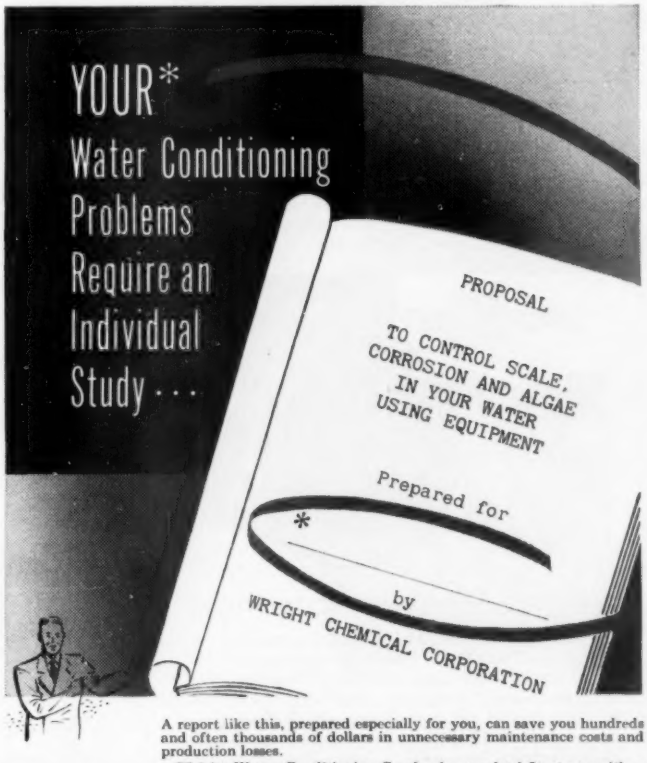
By Carl F. Hoot

THE year 1952 brought a record volume of drilling throughout West Texas but not a single field that might be classed as a major discovery. This is excepting the Spraberry trend area where reserve estimates will have little validity until new methods of recovery have been proved.

Andrews County

Considerable importance, however, is attached to the deep exploration and pre-Permian discoveries on the east side of the Central Basin platform. Eastern Andrews County was the scene of extensive, and expensive, lease plays and seismic operations, and the area accounted for a number of promising new pools.

Magutex field . . . Uppermost on the



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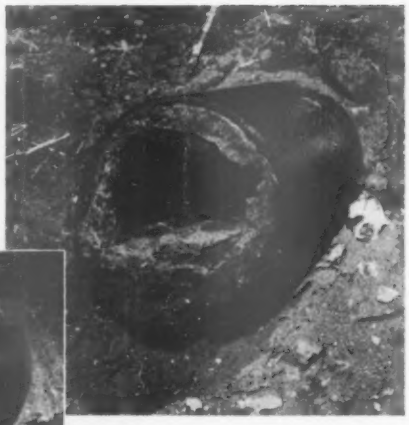

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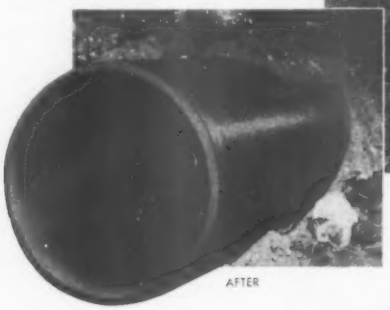

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list of Andrews discoveries is Magutex field, opened by Magnolia Petroleum Co. 1 University in Section 17, Block 8, about 12 miles northeast of Andrews (A on map). This well, completed in April, found prolific production in both the Devonian and the Ellenburger, and completed in the deeper formation. Potential was 556 bbl. a day. Decision to drill the 1 University was made after several seismic surveys. Location for the first test was directly on top of the picture.

Offsets to Magutex discovery, ½ mile north and south, have been drilled. The north offset was completed as an Ellenburger well, making potential of 324 bbl. daily. It had only 50 ft. of pay above the water compared with 75 ft. in the discovery well. Final perforations at 13,873-13,900 ft. in the north offset make it the deepest oil producer in the Permian basin. Both the discovery and the confirmation well produced relatively heavy oil for their producing depths, it being about 45° gravity.

South offset to the discovery was at a depth of 13,904 ft. in the Ellenburger at year's end. It had promises of making a sizable well in both the Devonian and the Ellenburger. Top of the Devonian at 12,493 ft. was 157 ft. high to the same marker in the discovery, and drill-stem test at 12,501-31 ft. flowed 76 bbl. of oil in 2 hours. Drill-stem test in the Ellenburger at 13,889-13,904 ft. flowed 73 bbl. of 46°-gravity oil in 2 hours, but recovery in the pipe included 260 ft. of salt water.

Devonian discovery . . . Possibility of a new deep producing trend paralleling the existing Permian pools on the platform was strengthened by completion of Phillips Petroleum Co. 1-CC University (B on map), northwest of Magutex field. This well was hailed as an Ellenburger discovery until the flow died and salt water intruded. Highest flow from the Ellenburger was at the rate of 40 bbl. an hour. Operators then plugged back and completed for a daily flowing potential of 2,310 bbl. of oil from Devonian perforations at 12,490-12,556 ft. This well had top of the Devonian 29 ft. high to Magnolia 1 University.

Shell Oil Co. 1-A University (C on map), 8 miles southeast of Andrews, added to the prospective new trend with prolific production from the Ellenburger, after finding shows of oil through the Pennsylvanian and the Devonian. Drill-stem tests in the latter formation recovered heavily oil and gas-cut mud, plus some free oil. At year's end the well had established a flow of 718 bbl. of oil in 24 hours through 16/64-in. choke, with no water. Gravity of the oil was 51.6°.

Deeper pays . . . Pre-Permian production was also established in and around the older areas on the platform. One of the most promising of these new fields was Gulf Oil Corp. 1-NNN University (D on map), Section 21, located 10 miles southwest of Andrews. Gulf's discovery was located on an anticline detailed by subsurface geology. Potential was 1,015 bbl. of oil a day through ¼-in. choke from the Ellenburger.

By year's end the new field, known as the Triple N, had three completed

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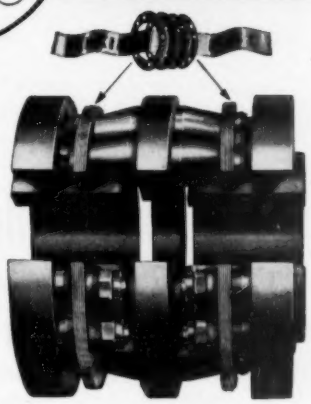

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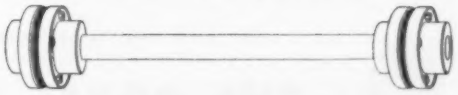

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wells, one dry hole, two drilling wells, and one location. Gulf 1-AQ State, ½-mile southwest extension to the field, ran high on the Ellenburger to the discovery and on the basis of drill-stem tests, promised to be the best well in the area.

The 1-AQ State at total depth 12,576 ft. had an indicated 176 ft. of Ellenburger pay, and operators expected the section to hold for another 50 to 75 ft. before entering water. Drill-stem tests from top of the formation, around 12,400 ft., flowed slightly less than 100 bbl. an hour, under pressure of 4,100 psi., and later tests to 12,576 ft. gaged a little under 200 bbl. of oil an hour.

Deep production was added to the Block 12 field on the west side of Andrews County at Phillips Petroleum Co. 1-EE University (E on map). The well found the Ellenburger low to nearest deep tests and went into water around 11,045 ft., but had logged 315 ft. of pay section and was completed for 1,498 bbl. of oil a day. Commercial production was also indicated in the Devonian.

Anderson-Prichard Oil Corp. 1-24 Fasken (F on map) added Ellenburger pay to Midlands Farms field, rating 675 bbl. of oil a day through ⅜-in. choke.

The Texas Co. opened Devonian production in Section 22, Block 6 (G on map), in northeast Andrews County, after finding the Ellenburger dry at 13,690 ft. Potential was 377 bbl. a day through ½-in. choke. The same firm's 1-AB State, Section 22, Block 5, made a small well in the Devonian. Potential on the pump was 133 bbl. a day.

Elsewhere "On Trend"

On the southeast end of this deep discovery trend, northeast of Odessa in Ector County, Texas Gulf Producing Co. 1 Headlee (H on map) had good promises of an Ellenburger discovery at year's end. Production tests through ¼-in. choke at 13,106-13,270 ft. produced up to 25 bbl. of oil an hour, under flowing pressures that ranged to 4,800 psi.

Amerada Petroleum Corp. may have tied West Texas and Southeast New Mexico Devonian production together at its 1 Weems (I on map), northwest Yoakum County wildcat. The well, which had good flowing production in the Mississippian limestone, was completed as a 1,934-bbl. well in the Devonian at 11,773-11,860 ft. There was no formation water and completion was made without acidization. Drill-stem tests in the Mississippian at 11,020-95 ft. flowed up to 100 bbl. of oil an hour, marking the first production on that scale in the Permian basin from that formation. The Mississippian carried high-pressure gas which prevented drilling ahead to the water table in the Devonian, circulation being lost whenever mud was made heavy enough to prevent a blowout from the Mississippian. At total depth of 11,860 ft., 1 Weems had cut 158 ft. of Devonian pay.

Spraberry Trend Area

The "rise and fall of the Spraberry," as some operators have expressed it, contributed much in the way of drilling records.

Figures on drilling during the year show that Midland, Upton, Glasscock, and Reagan counties gained 1,564 development wells and 96 wildcats. In those counties Spraberry drilling accounted for most of the totals.

At the trend's development peak nearly 10 per cent of the nation's rotary rigs were concentrated in the area.

The great number of operators involved and high completion potentials (which in most cases soon dropped to below allowable levels) spurred drilling of these boom proportions. Warnings on the economic aspects of 40-

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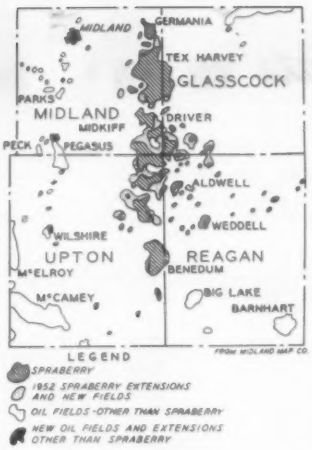
acre development were sounded throughout the year, but drilling continued unabated until the steel strike of the third quarter brought operations to a near standstill.

This is a vast area stretching a little less than 50 miles in length, from the north end of Midland County to Benedum field in the middle of Upton County. In breadth it tapers from a few miles at Germania field on the north to the entire width of Reagan County plus a portion of Upton County about 30 miles south and then back to a few miles at Benedum at the south end. It is generally agreed that the limits of the productive area are not in sight if recovery methods can be developed to make operations economical.

Atlantic Refining Co.'s water-imbibition program for oil recovery from Spraberry rock started on a pilot-plant scale in the Driver area in November. This experiment has been the only possible solution yet offered for recovering enough oil to make the wells pay out. By the end of the first quarter of 1953 Atlantic engineers should be able to evaluate the ability of this process to recover up to 1 billion barrels of oil.



In mid-December, the Texas Railroad Commission approved 80-acre spacing for the Spraberry trend area, after 53 operators in the area had petitioned the commission for a change in the proration units from 40 acres.

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NORTH TEXAS

Improved Drilling Practices Keep Proved Area Active

By Carl F. Hoot

THE year's operations in North and West Central Texas assumed high proportions in the number of wells drilled, with many scattered new fields opened, extensions, and new pays added to proved areas.

Operators were getting the upper hand in completion practices in the tricky Caddo and Bend conglomerate cherty sections, and those zones were explored extensively in Montague and Jack counties.

Montague County accounted for a total of 96 wells drilled as wildcats, of which 37 were completed as oil producers. The high percentage of successful wells has been attributed to a determined effort on the part of established operators to educate drillers in the process of proper muds, cementing procedures, and completion practices in general. Increased use of oil-base muds during the year for drilling-in has saved many a well that might have mudded-off the pay section under old drilling methods.

Drilling in proved areas in Montague County accounted for a total of 211 wells with a net footage of 1,150,679. Of that figure, 167 were completed as oil producers and 44 were dry holes.

Considerable exploration took place in Jack County and new conglomerate production was found northeast of Jacksboro. New pay zones were also added to old Bryson field, southwest of Jacksboro.

Jack County wildcats totaled 163, of which 32 completed as oil wells, 7 as gas wells, and 124 were dry. Total footage was 618,358. Field wells in the county totaled 329, of which 240 were oil wells, 8 gas wells, and 81 were dry. Total footage in development wells was 1,236,961 ft.

Grayson County, transferred from Railroad Commission District 5 to North Texas District 9 during the year, added considerable oil reserves as a result of extensive exploration, and development of known fields. Of the 23 completed wildcats 3 added new fields, a low percentage of successful wells, but a fair figure considering the faulted structures existing throughout the county. Most of the exploration work was to 8,000 ft. or deeper, and total footage drilled was 146,761. Field development wells totaled 106, of which 93 were successful completions. Total footage drilled in fields was 631,689.

At year's end the high-gravity, 10,000-ft.-plus, production in Big Mineral Creek field had two producers and further development was planned. Lone Star Production Co. was installing dehydrating equipment to handle the output.

In North Texas, District 9, completions for the year totaled 3,205, compared with 2,691 the previous year, or a gain of nearly 20 per cent. Ratio of oil wells to total completions was 52 per cent, up 1 per cent over last year, but ratio of successful wildcats to total drilled dropped from 20 per cent in 1951 to 15 per cent in 1952.

Wildcat completions in District 9 totaled 1,408 for the year, of which 212 were completed as oil wells. The previous year 862 wildcats were drilled, of which 178 were oil producers. The high ratio of wildcats in northern Texas is explained by the faulted areas and the many small oil-bearing structures which are not interconnected. Under these conditions, most edge-well locations or long offsets are wildcats until proved otherwise.

The upturn in percentage of successful wells to total number drilled is small but important. The increase of 1 per cent in North Texas District 9, and 4 per cent in West Central Texas District 7-B, is relatively good considering the large number of very small operators in the area who make a hurried entry into the oil business and an equally fast exit, via dry holes. This upturn in successful oil wells is attributed mostly to studied completion practices, development of mud programs applicable to the formations encountered, and a greater application of geological and geophysical methods available.

Of top importance to North Texas production in general is the development of water flooding as a secondary-recovery method, and the acceptance of pressure maintenance when used as a primary method of recovery. Engineers' studies on the latter method have shown that in gas-expansion areas, such as predominate in North Texas, recoverable oil is more than doubled when bottom-hole pressures are maintained from an early period in the field's development.

At this time a movement is under way to apply pressure-maintenance recovery methods to Worsham-Steed field in southeast Jack County. Water-flood programs now under way in North Texas District 9 total 195, according to the North Texas Oil and Gas Association headquarters at Wichita Falls. That office, in conjunction with the local Bureau of Mines office, has made extensive surveys on the subject and data gained are available to all operators in North Texas.

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Texas Panhandle . . . The discovery and extension of the Texas Panhandle's Quinduno field in Roberts County has kept exploratory interest high in this northwestern portion of the Anadarko basin.

Discovery well of Quinduno field, drilled by Gulf Oil Corp., was completed at 4,000 ft. in the Brown dolomite of the Albany (Permian-Wichita). On test it flowed 78 bbl. of 51°-gravity oil in 6 hours with a gas flow estimated at more than 8,000,000 cu. ft. daily. A ¾-mile south extension well flowed 102 bbl. of oil on test, and a 2½ mile southeast extension test flowed about 43 bbl. of 52.5°-gravity oil in 6 hours. Both wells produced from the Brown dolomite.

Gulf also completed a deeper-zone discovery in the field in Pennsylvanian granite wash at about 6,735 ft. for 125 bbl. of oil daily. This well is located about 25 miles northeast of the old producing areas of the Texas Panhandle.

West Central Texas

West Central Texas, District 7-B, had 2,335 total completions in 1952, compared with 2,326 the previous year, a very small net gain. Percentage of oil-well completions to total wells rose from 45 per cent last year to 49 per cent in 1952. Wildcats drilled totaled 1,035 in 1952, of which 216 were oil wells, compared with 1,019 last year, that included 193 successful wells.

Drilling in this district held steady around 50 completions weekly, field wells and wildcats, throughout the first half of the year but dropped in August to 42 weekly average, and in October dropped still further to 37. That rate held until December, during which an average of 40 completions were reported weekly.

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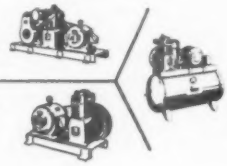

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EAST TEXAS

Several Deep Tests Fail To Find Objective Zones

By Carl F. Hoot

EXPLORATORY drilling in East Texas during 1952 continued moderate as in the past. Future hope for this prolific producing area apparently lies in deeper formations, particularly the Smackover (Jurassic), but two wells drilled to tap this formation drilled into salt and were still in it at total depths of more than 12,000 ft.

Successful developments in East Texas during 1952 included the establishment of oil production on the southwest flank of the Carthage gas field by Arkansas Fuel Oil Co. and Kinsey & Kinsey, both Shreveport operators. Previous oil production had been found on the southeast rim of the field.

In Freestone County, Humble Oil & Refining Co. 1 Fred Marberry, ½ mile northeast of Kirvin, was drilled to 13,595 ft. The well had no shows in the lower formations and was plugged back to complete as a small gas discovery in the Rodessa at 6,544-60 ft. Potential was 5,000,000 cu. ft. of gas daily, plus 6 bbl. of distillate.

Plans for developing Rains County's hydrogen sulfide project have been at least temporarily shelved by the drilling of two dry holes offsetting the 1951 discovery, R. J. Caraway 1 Puckett, 4 miles southeast of Emory. This gas-distillate discovery was so high in sulfur content that piping the output to a refining site would require special corrosion-resistant pipe. Further, cost of an extraction plant and facilities were such that from four to six wells would be needed to make the project pay out.

First failure was Caraway 1 Jenkins-Shipp, about 1 mile southwest of the discovery. This well encountered a series of deep-well drilling troubles and was in salt at total depth of 12,050 ft.

Shell Oil Co. entered the picture and drilled 1 Prince, about 1 mile northeast of the discovery. At this location the Smackover limestone apparently had faulted out, and at total depth of 13,493 ft. the 1 Price was still in salt.

According to some reports, a sulfur-extraction plant would be erected upon completion of two additional producers. Output from the wells, however, would have to be comparable to the discovery, which rated a completion potential of 45,000,000 cu. ft. of gas daily plus 208 bbl. of distillate. Sulfur content of the gas was so high that estimate of sulfur yield was around 17 tons per 1,000,000 cu. ft.

TEXAS GULF COAST

Prolific Area Continues To Yield New Reserves

By Wilma Van London

ACTIVITY in District 4 centered around Jim Wells, Hidalgo, San Patricio, and Webb counties during 1952. In these four counties alone a total of 46 successful exploratory wells was drilled with Hidalgo leading the district with 13 successful oil and gas discoveries to its credit.

An interesting discovery in Jim Wells County was the Howell 1 J. E. McClaugherty which was drilled on a lease extending across the Nueces River into San Patricio County. The well was produced from the Vicksburg zone and completed as an oil well opening Howell field. Operator immediately completed 1 Walter Brumme, offset, which potentialed 87 bbl. of oil per day. J. W. Gorman brought in 2 B. W. Cox across the Nueces River in San Patricio County for a potential of 113 bbl. of oil per day.

Farther down the coast near the southern tip of the state, exploration activities are at a minimum. Kenedy County, which is situated between Kleberg and Willacy counties, experienced more drilling than the two adjoining counties, but had little success in developing producing wells.

Five new gas pools were discovered from pay sands in the ever-prolific Frio zone. An important strike in this zone was the La Gloria Corp. wildcat which opened Kenedy Ranch field. La Gloria 1-A Kenedy Ranch, just south of Baffin Bay, was brought in on open-flow production of 42,000,000 cu. ft. of gas per day. A successful confirmation well was drilled about 1 mile northeast of the discovery.

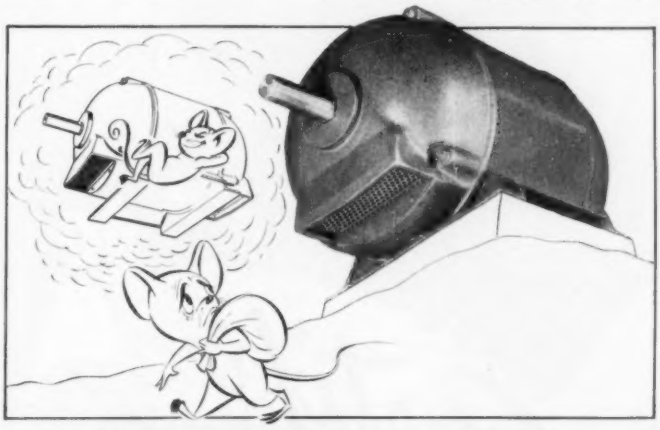
In Kleberg County, Richie & Mumme brought in the first successful exploratory well in the county in September. Well was a shallow discovery with pay sands in the Miocene zone. The discovery was completed about the time Humble Oil & Refining Co. completed 1-B Mrs. S. K. East in the same formation just across the line in Kenedy County.

In Aransas County, the smallest county in Texas District 4, most drilling operations are carried on at water locations as the area is approximately 50 per cent inland waterways.

Activity centers around Aransas Bay, Copano Bay, and Lamar Fulton Beach. An important discovery in Copano Bay was Phillips Petroleum Co. 23 Copano Bay which potentialed 120 bbl. of oil per day. The wildcat opened a new oil pay in West Fulton Beach field. Completed simultaneously was Sun Oil Co. 3-75 Copano-State Tract 75 which potentialed 144 bbl. of oil per day. Both wells were completed from the Frio production zone.

Deepest producing wildcat well in District 4 is located in Brooks County. Humble Oil & Refining Co. 2 Robert J. Kleberg, Jr., Tract was completed at a total depth of 12,000 ft. Production was from the Vicksburg formation through perforations at 8,494-98 ft. The well potentialed 51 bbl. of 38°-gravity oil per day.

Gutierrez field became the focal



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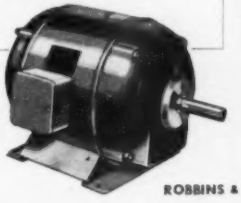

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point of interest in Webb County when Bright & Schiff brought in two wildcat discoveries in the Rosenburg sand. The 1-A J. O. Walker was completed through open hole with oil sand producing 24.7°-gravity oil and the 2-A J. O. Walker potentialed 70 bbl. of 24.5°-gravity oil per day.

District 3 Developments

Exploratory drilling in District 3 was slightly suppressed this year in the face of the continued productivity of such established fields as Spindletop, Hull, Village Mills, and Boling.

Wharton County led the district, completing 41 wildcat wells during the year, 9 of which were successful. Highlight of the year in Wharton County was the gas discovery tentatively named Bronson Home field. The well was brought in by Grubb & Hawkins for a potential of 7,500,000 cu. ft. of gas per day, establishing a new gas reservoir for the area in the Frio zone. Firm immediately drilled a confirmation well which produced 1,840,000 cu. ft. of gas per day.

A new oil-pool discovery well drilled by Ginther, Warren & Ginther is believed to be the deepest pay for Fulshare field in Fort Bend County. The 1 Mrs. Ethel Tucker Christian was completed at a total depth of 7,850 ft. with perforations at 7,512-15 in the Yegua formation. Other production in the immediate area was 6,800 ft. and 7,300 ft.

Discovery well of Fulshare field was Union Producing Co. 1 Watson, which produced 102 bbl. of oil per day from the Yegua. A minimum of four sands in the Yegua of Fulshare field have been found productive and there is evidence of several other productive sands. Fulshare field was extended 1 mile west by Newton-Conroe Oil Corp. 1 J. A. Barlett, which potentialed 100 bbl. of oil per day through perforations in the Yegua.

Immediately adjacent to Fort Bend County on the northeast is Harris County, most prolific county in District 3. During 1952 231 wells were drilled in the county, 159 of which were successful for a success ratio better than 50 per cent. Such old, established fields as Tomball, North Katy, and South Houston are chiefly responsible for production in Harris County.

In October, Sohio Petroleum Co. extended South Deckers Prairie field, Montgomery County, into Harris County by completion of 1 Martin Brautigam as an oil producer. However, on the basis of subsurface studies, it is apparent that the well is in a separate fault segment from other wells in the field.

Late in December, K. & H. Operat-

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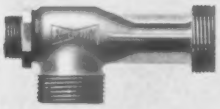

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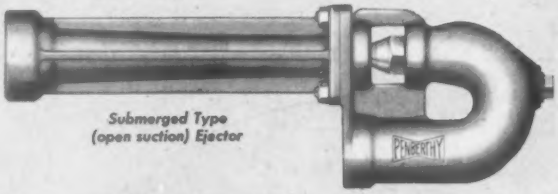

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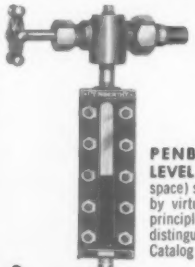

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ing Co. 1 Harmeyer, 1¼ miles south of Deckers Prairie field, was completed flowing 133 bbl. of 38.6°-gravity oil per day. This well is believed to be producing from the same reservoir as Sohio 1 Brautigam. A. W. Heat et al of Houston has staked location for a 5,800-ft. wildcat test 1 mile south of South Deckers Prairie field production in Harris County in an effort to confirm production in Segment "A," as new Harris County production of South Deckers Prairie field is being called.

Increasing in importance in District 3 is Hardin County. Production in Hardin County is relatively young compared to that in Harris, Wharton, and Liberty counties. An important discovery for the year in Hardin County was South Hampton field brought in by American Republics Corp.

Brazoria County

Located on the Gulf Coast in District 3 is Brazoria County, one of the most productive counties in the area. Brazoria completed 110 wells during 1952, 75 of which were successful. One out of every six successful wells completed in Brazoria County this year is a gas well.

One of the largest and most productive fields in Brazoria County is Chocolate Bayou. The field was discovered in 1939. It boasts the deepest producing oil well in District 3, Phillips 1-A Houston "R" producing from 12,846½-54½-ft. zone in the Frio sand. The well was completed in February 1952 at a total depth of 13,658 ft. In March 1952, The Texas Co. opened a southeast extension to Chocolate Bayou field with the completion of its 1 John W. Harris well.

Phillips Petroleum Co. discovered a new deep producing zone which promises to increase substantially the already large gas reserves in the field Initial tests through perforations 13,945-50 ft. in the basal portion of a lower Frio sand encountered between 13,901-49 ft., have indicated production rates as high as 22,000,000 cu. ft. of gas per day with considerable condensate content. Shut-in tubing pressure was gaged at 9,530 psi. In addition to this sand, the well has an aggregate of 146 net feet of untested gas-bearing sands occuring in six other new zones not previously produced in the field.

District 2 Active

Smallest district on the Texas Gulf Coast is District 2 which embraces only 10 counties. Although small in area, the district is very active, 823 wells being completed in 1952. Most productive counties are Goliad, Victoria, and Bee, in that order.

A significant discovery in the area during the year was Union Producing Co. A-31 McFaddin in Victoria County. Completion of this well extended East McFaddin field 1,000 ft. easterly. An extension to Maley field was made by Warren Oil Corp. in September by the completion of its 1 Rosa B. Borroum. This well potentialed 5,000,000 cu. ft. of gas per day from the Slick sand of the Wilcox.

District 1 Summary

In contrast to District 2, District 1 covers the largest area of the four Texas Gulf Coast districts and has the smallest production. District 1 spans Districts 2, 3 and a portion of 4 on the northwest. It is the only district of the four having no contact with the Gulf of Mexico. There are 33 counties in District 1 but only 758 wells were completed during 1952 compared to 823 completions in the 10 counties of District 2.

Atascosa County led the district in completions for the year. Out of a total of 178 wells drilled, 79 were successful. However, Caldwell County completed 118 wells, 89 of which were successful oil wells. Deepest well drilled in the district was Phillips Petroleum Co. 1-A Washburn in McMullen County, completed dry at a total depth of 16,510 ft.

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OKLAHOMA—KANSAS

Search For Oil in Wildcat Areas Gains Momentum

By Neil Williams

ALTHOUGH the bulk of exploration in Oklahoma and Kansas during 1952 continued to be directed to older areas, the search for additional oil and gas reserves in other parts of these states gained momentum and accounted for many significant developments. These developments, accumulating knowledge of conditions in the newer areas and throwing additional light on their potentialities, are opening the way for still more widespread and intensified wildcatting in those areas.

Exploration in the older areas, necessarily limited in most cases to stepout and extension locations more or less close off the flanks of existing pools, new pay zones in and around these pools, or in some instances, to more removed localities previously discounted or only partly condemned by old dry holes, resulted in a numerically impressive list of discoveries. Although most of these discoveries were small individually and of limited extent, in the aggregate they represented a substantial additional of new production and reserves.

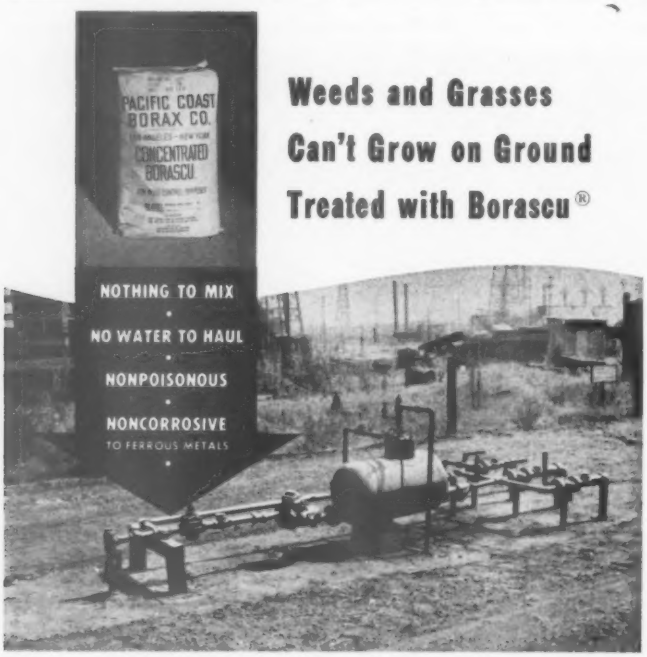
In the older areas of Oklahoma, Lincoln and Payne counties were particularly active, leading the state in amount of wildcatting and number of discoveries. Areas of Logan County, adjoining Payne County on the west, also witnessed considerable new exploration. Okfuskee, Hughes, Seminole, and Pottawatomie counties, in the central part of the state, as well as Stephens, Carter, and Garvin counties, in the south central part of the state, also proved unusually attractive.

Among the more important discoveries in these older and already heavily drilled counties was East Payson field, in southern Lincoln County. Opened by Gulf Oil Corp. in April with production from the lower Skinner sand at about 4,100 ft., the pool has had an active development, and at the end of the year had more than 25 producing wells. Discoveries in the Chandler area, to the north but still in Lincoln County, and in the Iconium and Coyle areas along the Payne and Logan county line, also appeared to be above the average run.

Finding of fairly prolific oil and gas production in an unconformity sand at the base of the Pennsylvanian in wildcatting just east of the fault along the east side of the old Oklahoma City field, brought to light additional possibilities for development.

In Kansas, there was no abatement of exploration along the Central Kansas uplift, extending in a northwesterly-southeasterly direction through the western and central part of the state. Despite the extensive exploration and development that has been carried on along this trend for many years, and high density of field uncovered, numerous discoveries continued to be made. Barton, Stafford, Ellis, and Rooks counties, in the heart of the trend and already the most densely drilled sectors, led the state in amount of exploratory drilling and new discoveries.

Back in Oklahoma, there was another revival of interest in the potentialities for exploration in the comparatively meagerly exploited southeastern and eastern counties, those comprising a portion of the McAlester basin. This was brought on by the development of substantial oil and gas-distillate production in McLish and Oil Creek sands in the East Oconee area of Coal County, and the discovery late in the year of a new Bromide sand pool northwest of Tupelo, in the western part of the same county. That region has undergone occasional small flurries of exploration, but only a few scattered small pools, mostly shallow



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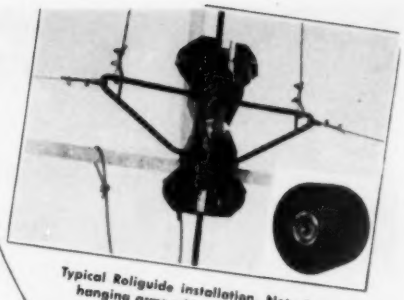
* is a PB Wire Line Guide, and

◎ is a rubber roller that contacts the line and dissipates the dangerous shock and vibration.



Typical Roliguide installation. Note length of hanging arms which provide proper stabilization. Inset, right, Replacement Roller.

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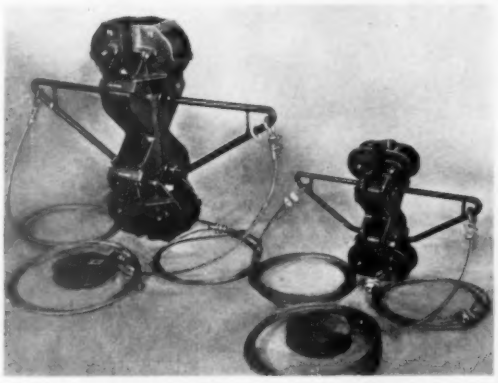
Both PB Standard and Roller Type Guides utilize the same dampening principle to stop wire line vibration. Rubber stabilizing elements or rollers absorb the vibration which is then dissipated through the rugged guide body to the hanging assembly. You're assured a straight, steady length of wire *through which waves cannot travel.*



ROLIGUIDE, left, is a heavy-duty roller type guide for deep wells. Handles lines to 1⅛" in diameter at high line speeds. ROLLETTE, right, for all average depth drilling, features the same design and construction as the larger ROLIGUIDE. Replacement rollers of solid, long-wearing rubber, with integrally molded roller bearings and housing are available on order.

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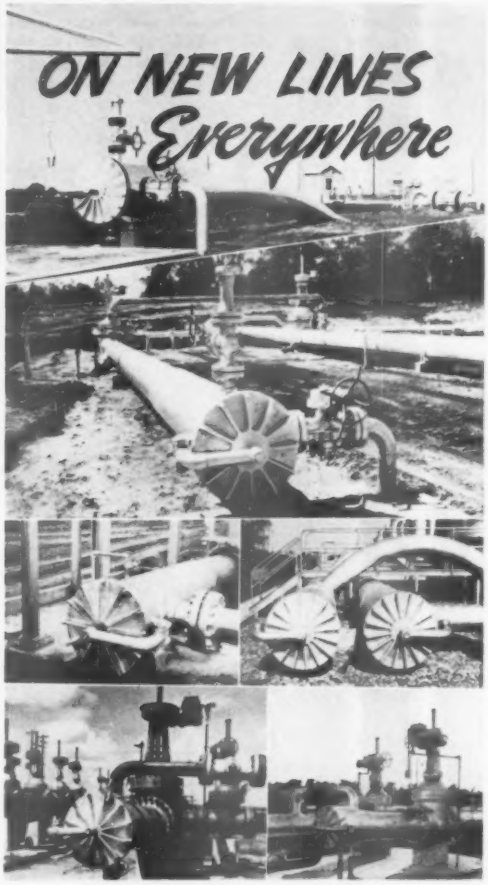

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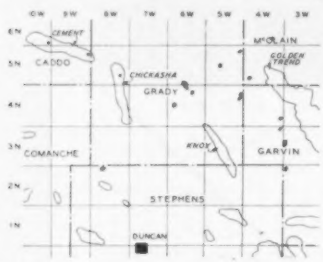
gas production, have been uncovered.

Exploration and development of Springer-sand potentialities continued to spread in fields of southern and southwestern Oklahoma, and was extended to additional new areas along



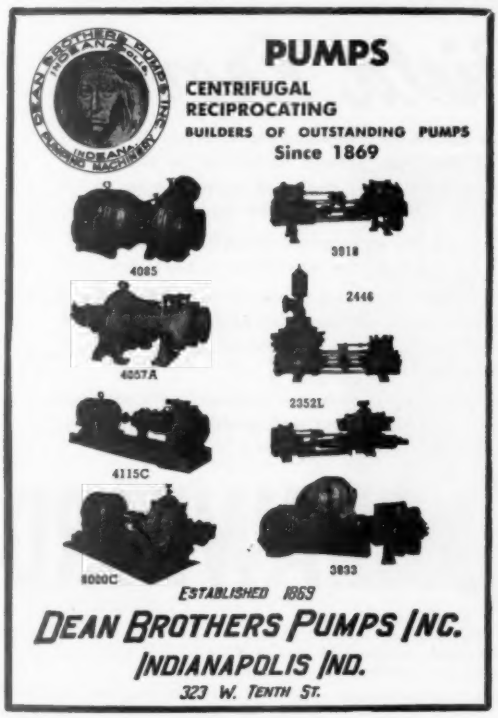
the southern and eastern rim of the Anadarko basin. This exploration was given added impetus by discoveries late in 1951 and early 1952 of prolific gas production in the Springer sand by deeper drilling in Cement field of Caddo and Grady counties, and the old Chickasha gas field of Grady County.

During the past year, Springer sand was found productive in five additional new areas along the trend extending southeastward between the above fields and the fields of Stephens and Carter counties, where Springer sand has proved an important source of new production. These include the Chitwood area, about 12 miles east of Chickasha field, and Southeast Bradley pool, about 8 miles farther to the southeast, both in Grady County; and, farther to the southeast, Northeast Purdy, East Purdy, and Southeast Purdy pools, in Garvin County. The latter three fields are spaced about 3 miles apart on a line along the extreme eastern edge of the Anadarko basin on the west flank of the Golden Trend development, where Springer sand is absent.

Springer production also was extended about 25 miles northwestward along the trend from Cement field with the opening by Stanolind Oil & Gas Co. early in the year of Northeast Gotebo field, northeastern Kiowa County, on the south rim of the Anadarko basin. Three additional Springer producers have been completed in the pool, one by Stanolind, and two by Gulf Oil Corp. The discovery occasioned the drilling of a half dozen other deep tests in the general area, extending into southern Washita County, all failing to get production although several encountered oil and gas showings.

Exploration in far-western Oklahoma counties, comprising the main part of the Anadarko basin, uncovered at least five additional new fields. Promising indications of production were given in as many more areas, where deep wildcat tests encountered good showings of oil and/or gas but were unsuccessful in attempts to make commercially productive wells. It is difficult at this time to evaluate the individual importance of most of the areas in which production was found, because, in most instances, only the discovery well has been completed. However, the extent of the discoveries, in widely scattered areas in a vast region in which only relatively limited exploration has been undertaken, provides additional light on the extent of the potentialities of the region, and gives added incentive for more intensive exploration.

Among the more significant discoveries in western Oklahoma were Northeast Seiling field, in southwestern Major County, near the Dewey County line, where Continental Oil Co. found what appears to be important gas-distillate production in the Mississippian-Chester; South Laverne field, more than 60 miles to the northwest in southwestern Harper, where Sunray Oil Corp. opened gas-distillate in the lower Pennsylvanian-Morrow sand; and South Salon field, about 15 miles southeast of the Sunray discovery, in northern Ellis County, where Carter Oil Co. got gas-distillate production in the Morrow-Chester lime section. These discoveries



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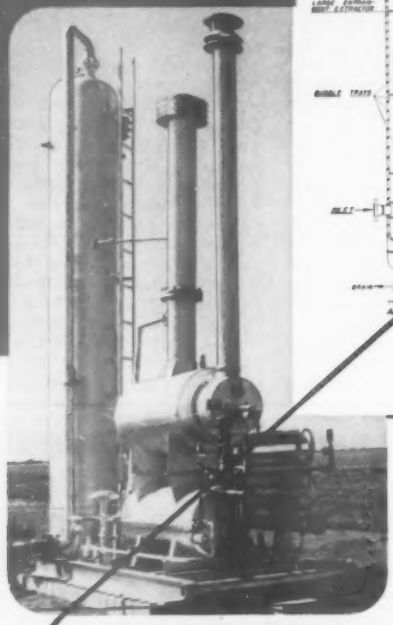

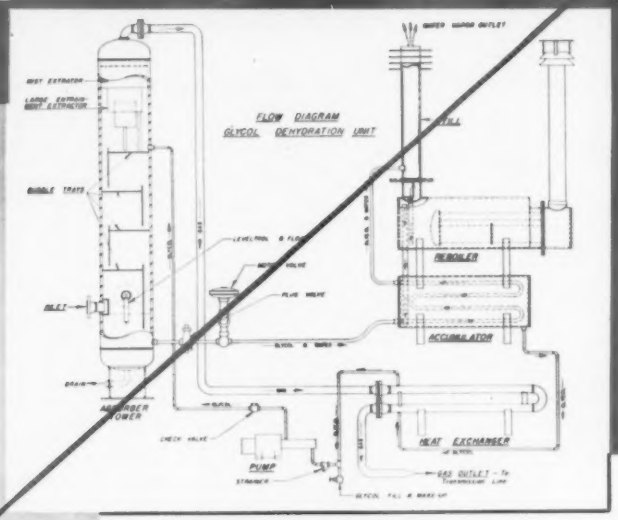

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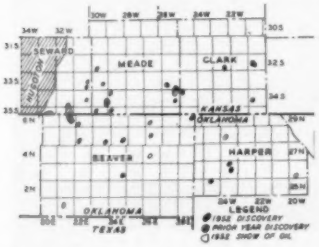
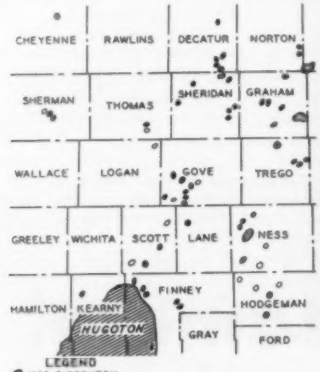
are in the northern portion of the basin. Other discoveries, located much farther south in the deeper portions of the basin were in the younger Deese and Hoxbar granite wash zones.

To the northwest in the shallower portion of the basin east of Hugoton gas field a more concentrated, active wildcatting and development program was carried on, embracing the eastern Oklahoma Panhandle, principally Beaver County, and the bordering Seward, Meade, and Clark counties of southwestern Kansas. Not only were producing areas of existing fields in this region substantially widened, but the active wildcat drilling proved highly successful with numerous discoveries (shown on accompanying map) being



made, not only in the deeper Morrow and Mississippian horizons but also in the shallower Pennsylvanian Oswego lime, Marmaton, and Lansing lime zones. Beaver County, following the opening of its first oil-producing field early in the year, was the scene of an intensive leasing play that spread through the region and into adjacent Texas Panhandle counties.

The upper part of the Hugoton embayment of the Anadarko basin, in western and northwestern Kansas, also continued to prove attractive for exploration. As in the main part of the



Anadarko basin of western Oklahoma, exploration in this region was widely scattered, but resulted in a fairly impressive list of new discoveries, indicated on an accompanying map of this region. Most of the new pools discovered in this region so far have not proved large, and wells completed have been more or less typical of the usual run of completions in pools along the older Central Kansas Uplift development to the east. However, their widely scattered locations in a vast region of sparsely explored potentialities leaves opportunities for uncovering more important producing areas and provinces. Additional incentive is being given to more active and intensive exploration in the region by the fact that, in addition to the new pools already definitely proved, most of the wildcats drilled have encountered promising oil and gas showings.

Gove, Hodgeman, and Finney counties, in the heart of the embayment, continued to draw the greatest amount of wildcat activity, and, in turn, led in number of new discoveries during the year. However, increasing interest is being directed to adjacent and other counties farther north and west. Discoveries of the year included a new Marmaton lime pool at North Fork, northwestern Lane County, which gave this little-drilled county its first production. The year's developments also

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included the opening of the first oil production inside the limits of the vast Hugoton gas field. The discovery well of this production, in Marmaton lime, is located 12 miles south of Garden City, in Finney County, and is one of the few wells ever drilled below the gas-producing Permian zones of that field.

ARKANSAS—N. LOUISIANA

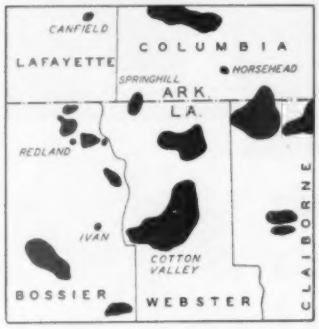
Area Yielded One Sizable Discovery During the Year

By John C. McCaslin

EXPLORATORY drilling in Arkansas and North Louisiana areas kept at about the same pace as 1951.

Arkansas reported 11 new oil discoveries compared to 14 in 1951, while North Louisiana recorded 23 new discoveries, the same as in 1951.

The most important discovery from the development standpoint in Arkansas and northwestern Louisiana was Springhill field, opened in April by



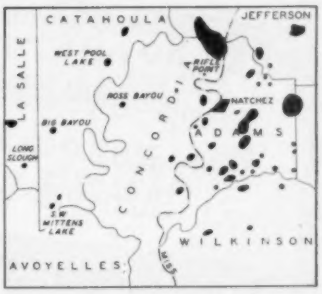
L. L. Robinson at 1 Kilpatrick near the town of Springhill, Webster Parish, Louisiana, and extending into Columbia County, Arkansas, making it a two-state producing area.

The discovery well at Springhill field is producing from the Tokio at 3,104-10 ft., average depth of the field's wells. Initial production at the discovery well was 216 bbl. of oil per day. There are now 53 wells producing in the field. Total daily production in the field averaged about 1,350 bbl. for the year.

Carter Oil Co. gave Ada gas-distillate field a new pay by completing its 1 Davis for 140 bbl. of oil daily in the Mooringsport at about 4,400 ft. The new reservoir has been completely developed.

Ouachita, Union, Miller and Columbia counties were the most active exploratory areas in Arkansas in 1952. Seven small producing areas were opened in the four counties. Arkansas counties in the Arkansas Valley saw some exploratory drilling during the year, but with no success except for a major extension to Cecil gas field in Franklin County.

Concordia and Catahoula parishes in northern Louisiana recorded the most wildcat tests during 1952. Of the 40 tests drilled in Concordia, however, only 1 was successful, opening Ross Bayou field in the Wilcox sand. Catahoula Parish had five small discoveries. These eastern parishes were active due to a stepped-up campaign for Wilcox production. The area lies just west of prolific Adams County, Mississippi, were 13 Wilcox discoveries were made in 1952. (See Mississippi.)



Wilcox Discoveries

Wilcox discoveries in Concordia and Catahoula parishes, Louisiana, and

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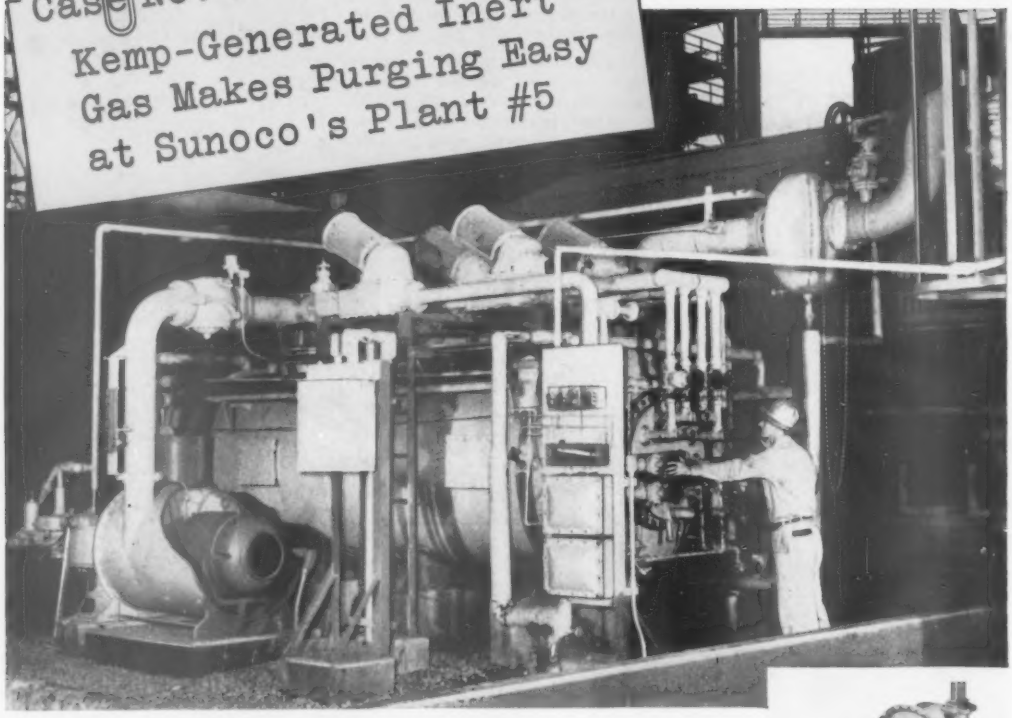

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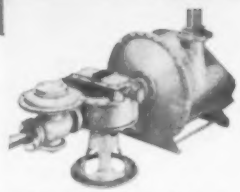

Photo above shows close-up view of Kemp Industrial Carburetor, the heart of every Kemp installation. Assures complete combustion... without waste, without tinkering. Reduces installation costs, simplifies maintenance.

For more complete facts and technical information, write for Bulletin I-10 to: C. M. KEMP MFG. CO., 405 E. Oliver Street, Baltimore 2, Maryland.

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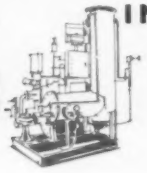

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across the Mississippi River in Adams and Wilkinson counties, Mississippi, were numerous during 1952.

There were more wildcats drilled in Concordia Parish than in any other parish in northern Louisiana; however, Catahoula Parish recorded the most discoveries. West Mittens Lake, Big Bayou and West Pool Lake fields were opened in Catahoula Parish, all producing from the Wilcox. Long Slough pool, located in La Salle Parish just west of the Catahoula discoveries, also produces from the Wilcox. Concordia Parish's new Wilcox fields are Ross Bayou and Rifle Point.

Mississippi . . . A total of 12 discoveries was recorded in southwestern Mississippi's Adams County during 1952, all producing from the Wilcox. Concordia Parish's Fairview field was extended into Mississippi late in the year when a wildcat, drilled by Humble Oil & Refining Co., was completed about 1 mile east of Fairview field to open East Fairview area.

The most promising new Wilcox fields in Mississippi's Adams County are Courtland, Moorland, North Kingston, Vernon, North Overton, Lake Lucille, Jeannette, and Locust Hill.

Northeast Mississippi . . . In this all-but-forgotten area, Union Producing Co. reworked an abandoned stratigraphic test and completed it for a calculated open-flow potential of 35 M.M.c.f. daily with an estimated 10 bbl. of 66°-gravity condensate per million cubic feet of gas. Production is from the Mississippian, probably Chester, at 5,816-5,274 ft. A confirmation well has since been completed.

This big gas well was the first significant production obtained from pre-Cretaceous rocks in Mississippi. It is in a province which laps over into northwest Alabama, currently being studied with high exploratory interest.

SOUTH LOUISIANA

Deep Drilling Finds New Reserves in Bayou Country

MOST of South Louisiana's drilling activity during 1952 was concentrated in or near known producing areas. Though no one discovery has yet been proved to be of outstanding importance, 46 new reservoirs were discovered in the area, which, in total, make a respectable showing of new oil and gas reserves for the year. The faulted nature of the reservoirs and the multiple pays in most of South Louisiana's fields often make discover-

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ies out of wells that are spudded as field development wells.

Plaquemines Parish, at the southeast end of the Mississippi River Delta, led South Louisiana in drilling activity during 1952. This area of marshes, lakes, and bayous completed 173 wells, 111 of which were successful. Wells in this parish averaged 10,900 ft. deep against an average depth of 10,000 ft. for all of South Louisiana.

Of potential importance was the discovery of a gas-condensate reservoir off the north flank of Lake Washington salt dome. This marsh-located dome in Plaquemines Parish has had some shallow oil production for several years but it has been primarily a producer of sulfur. The discovery well, drilled by John W. Mecom and Freeport Sulphur Co., flowed 195 bbl. of condensate from 11,872-11,938 ft. The Lake Washington piercement-type salt dome is of tremendous areal extent and additional oil reservoirs associated with this big "structure" can now be expected.

Kerr-McGee Industries, Inc., opened a deep multizone gas-condensate pool at a 20-mile-offshore location in Breton Sound, not in disputed "tidelands" area, Plaquemines Parish. It was estimated that total gas volume from four separate pay zones would exceed 100,000 M.c.f. daily.

All of the fields on the Mississippi River Delta produce from Miocene-age sand traps resulting from movements caused by deep-seated or piercement-type salt domes. These domes are located by geophysical means, with detailed seismograph work following reconnaissance seismograph and gravity-meter surveys. Geophysical work on the delta is carried out using marsh buggies, since the only high and dry land is located along the edges of streams which have built up natural levees.

Drilling on the delta is done from barges that are moved on and off location through man-dredged channels that cut across the marshes between the natural water courses.

During 1952 there was limited drilling in the disputed tidelands area off the Louisiana coast following the U. S. Department of the Interior's granting drilling permits "in the interest of conservation" in March. Prior to that time, since December 11, 1950—the date when federal authorities assumed ownership of the tidelands on the basis of the Supreme Court's ruling—offshore operations had been largely confined to completing wells then drilling, reworking completed wells, producing completed wells, and placing on production those wells which were shutin awaiting transportation facilities.

Terrebonne Parish, adjoining Plaquemines Parish to the west, has the deepest producing well in Louisiana. It is The Texas Co. C-3 State Lease at Bay St. Elaine field. The well was completed late in September 1952 from perforations at 15,350-62 ft. Union Producing Co. 2 Barrow in Terrebonne Parish established a new pay in Bourg field which may prove to be of considerable importance.

In Vermilion Parish, Union Oil Co. 2118-1 State Lease at West White Lake field was completed for an initial potential of 310 bbl. of oil daily. This wildcat discovery, 2 miles from the nearest production, is the first indication of significant oil production in what has been primarily a gas-condensate area.

In the southeast area of Pecan Lake field, Cameron Parish, Pan American Production Co. opened the first oil pay for the field in September at 4 Miami Corp. The well flowed at the rate of 498 bbl. of 35.8°-gravity daily.

Two discoveries in the Wilcox trend extending through central Louisiana into southwestern Mississippi, north of the main coastal producing areas of South Louisiana, were Kemp Drilling Co. 1 Fisher in Avoyelles Parish and The California Co.'s Rapides Parish

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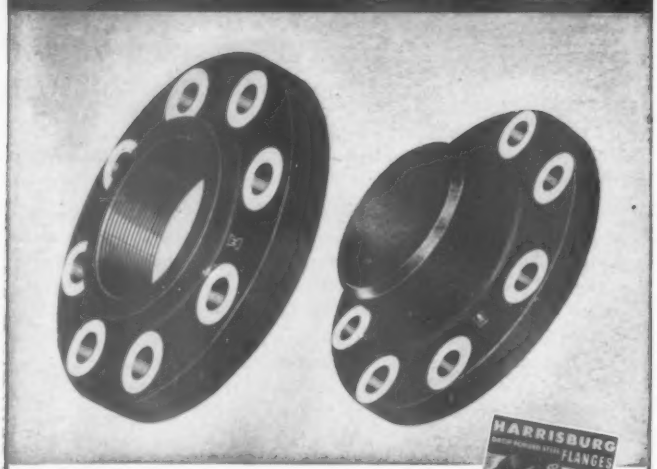

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discovery. The Avoyelles discovery was completed in November for 124 bbl. of oil daily. Rapides' single discovery for 1952 was completed in August for 290 bbl. of oil per day.

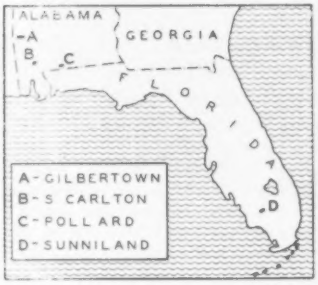
Wilcox production in North Bancroft field of Beauregard Parish was extended about 3,500 ft. southwest into the State of Texas by Atlantic Refining Co. c-2 Kirby Lumber Corp. The well flowed 250 bbl. of oil daily.

SOUTHEASTERN STATES

One Discovery Revives Exploratory Interest

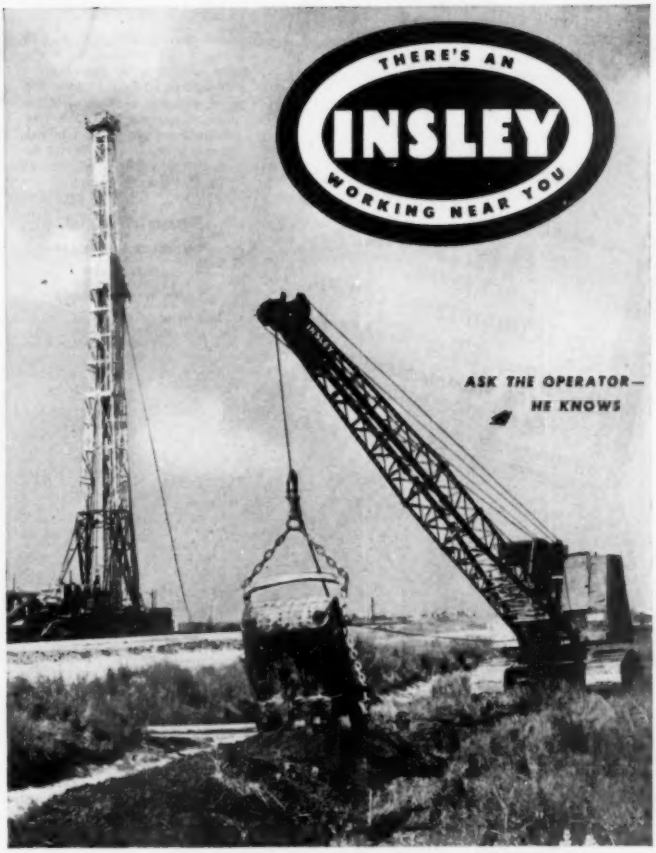
A DISCOVERY of oil in southwestern Alabama shortly after the beginning of 1952 resulted in a sudden revival of interest in the potentialities of southern Alabama, southern Georgia, and nearly all of Florida.

Humble Oil & Refining Co. 1 A. W. Moye, 18-1n-9e, was completed as the discovery well of Pollard field in a 25-ft. oil sand of the Upper Cretaceous-lower Tuscaloosa through perforations at 5,944-49 ft. for 314 bbl. of 30°-gravity oil on a 3/16-in. choke in January. By the end of the year this field, which has developed production in both deeper and shallower sands within the lower Tuscaloosa, had 21 producing oil wells. Oil accumulation at this field is apparently controlled by a highly faulted structure above a deep-seated salt dome.

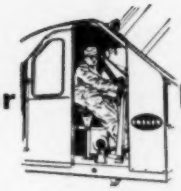


No additional field discoveries were made in the southeastern states during 1952 but exploratory activity especially seismic, had a rapid growth. Interest was centered in the lower parts of the Upper Cretaceous beds, a section which is a big producer in fields to the north and west.

Intelligently locating wildcats in this area requires lots of imagination. In general, gravity-meter and magnetometer surveys have not proved too reliable because of density contrasts and variations in the pre-Mesozoics. Core-drill studies are limited areally by thick blankets of irregularly bedded Tertiary



The INSLEY operator



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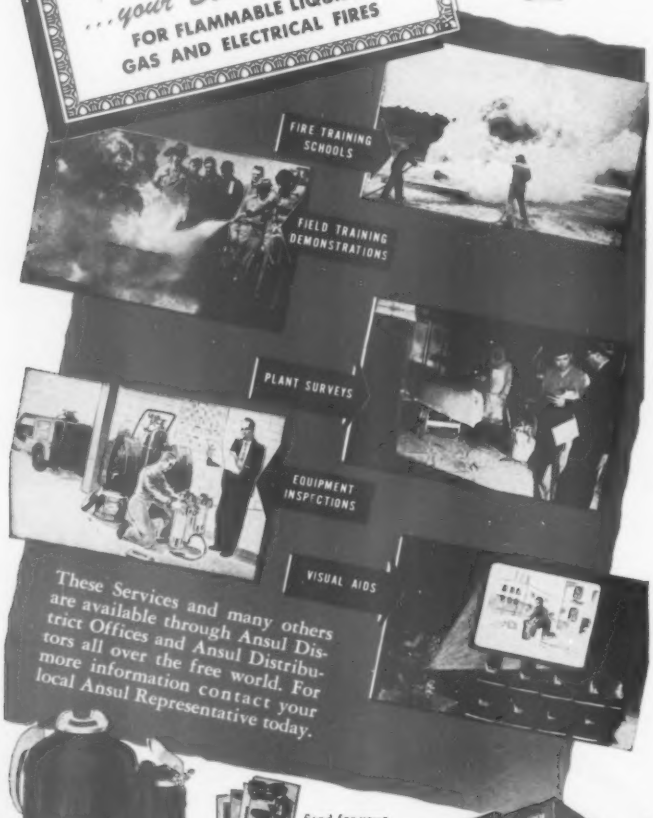

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limestones. Seismic surveying is difficult because of high-velocity beds near the surface; however, during 1952, considerable progress was made in developing seismic techniques that may give satisfactory results throughout many parts of the big area.

The year 1952 saw deep tests drilled in two of Alabama's producing oil fields. Carter Oil Co. took a deeper-pool test to 13,283 ft. in East Gilbertown and Humble drilled to 15,729 ft. at South Carlton. Neither well found commercial oil in deeper formations.

Florida has had no discoveries since Sunniland field, a 1943 discovery; but this state, from the Panhandle to the Keys, appears particularly inviting for the immediate future. Many companies which had moved out of the area are now back and reviving their exploratory activities. This coming year is expected to see considerable drilling in Florida and a substantial strike could set off a wave of activity to rival that of 1951's Williston basin.

CENTRAL AREA

Tristate Area Activity Was Primarily Routine

By Neil Williams

EXPLORATION in the tristate area of Illinois, Indiana, and western Kentucky was largely of a routine nature with few developments of particular significance outside the district.

Although a fairly impressive list of new discoveries was recorded, these consisted primarily of relatively small, localized pools, limited extensions, and opening of additional, already more or less known pay zones in existing fields.

Possibly of chief interest in the district from the standpoint of deeper exploratory knowledge was the new drilling depth record set by Superior Oil Co. in a well in New Harmony field, White County, Illinois. This well, in the deepest part of the Illinois basin, was carried to a total depth of 7,682 ft., reaching the Shakopee lime, which lies below the Ordovician-St. Peter sand, a possible source of new production for the district. However, the deeper-pool wildcat found that formation dry and was plugged back for completion in the Mississippian-Salem. Previous depth record was 7,207 ft., reached by another St. Peter test drilled in Wayne County several years ago.

Potentialities of Devonian-Silurian reef production around the outskirts of the Illinois basin received spasmodic attention. Several small discoveries were made, but no extensive exploration was undertaken.

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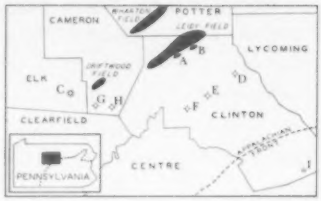
PENNSYLVANIA

Oriskany Sandstone Is Still Primary Objective

PRIMARY exploratory interest in Pennsylvania during the past year centered on deep drilling to the Oriskany sandstone. No tests were drilled below the Devonian.

Continued development in the vicinity of Leidy, an Oriskany gas field, resulted in northeastward extension of the main field and the discovery of two pools to the southeast (A and B on map).



In Cameron County development of another Oriskany gas field got under way. The present producing area of this field, Driftwood, is 2 miles long and ¾ mile wide. The southwestern limit of production is not yet defined but the field appears limited on the northeast by tight sand. Open flows from the 16 producing wells in this field ranged from 1 to 8 M.M.c.f. of gas.

About 8 miles southwest of Driftwood field, Keta Oil & Gas Co. completed a 2.5-M.M.c.f. gas well (C on map) to open a new field.

Three wildcats (D, E, and F) were completed dry on the Laurel Hill anticline in Clinton County and two dry holes (G and H) were completed on the Chestnut Ridge anticline in Cameron County.

The highly folded Appalachian region is currently being tested by Deep Rock Oil Co. 1 Walizer (I on map).

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MICHIGAN

Potentialities of Deeper Objectives Now Apparent

THE most significant development to arise from Michigan wildcatting in 1952 was the discovery of oil and gas in the basal Salina-Niagara formations at several wells in widely scattered areas. However, at the end of the year these discoveries appeared to have done no more than bring about an awareness that these deeper horizons offered important and interesting prospects. There had not been a single development program stimulated by these deeper pay prospects. The discovery wells themselves rated from good to very poor, but new horizons had been opened and more and more wildcats were being set up with the zones below the Detroit River-Richfield sections as their objectives.

What appeared to be the most encouraging of the three so-called Salina-Niagaran discoveries of the year was a well in Hamlin Township, Mason County, originally drilled by Dow Chemical Co. as a chemical brine test, and then reworked jointly by Dow, Brazos Oil & Gas Co., and Taggart Brothers Gas Co. This well, the 1 Dow-Brazos unit, SE NE NE 27-19n-18w, was rated as a Niagara oil discovery at 4,400 ft., plug-back depth, pumping about 20 bbl. of oil and a like amount of water a day natural. There was still a basal Salina gas pay, estimated at upwards of 7,000,000 cu. ft. of gas a day, based on drill-stem-test results, to be retested. Two offsets to this well were drilled out dry in the Niagara before Dow, Brazos, and Taggart joined to rework the chemical brine test, but there was still considerable area open for drilling and the development of an important gas-oil field.

Diagonally southeast across the state, Panhandle Eastern Pipe Line Co. con-

ducted and was continuing a wildcatting program which had developed one basal Salina gas discovery, at the 1 Ringel, C SE 31-4n-15e, Casco Township, St. Clair County, a well which was rated in excess of 14,000,000 cu. ft. of gas a day after acid treatment. Well was drilled to 2,763 ft. No other wells in the immediate area of this discovery were drilled in 1952.

Brazos Oil & Gas Co. completed a small basal Salina-Niagaran oil discovery well in north-central Michigan at the HE-1 State-Chester, C NE NE 15-29n-2w, Chester Township, Otsego County, rated at 15 bbl. of oil a day after acid treatments. Well was drilled to 6,712 ft. One semioutpost follow-up was drilled out dry in the lower beds.

The most important developments from an immediate viewpoint during 1952 were: (1) extensions of the Richfield oil pay in Rose City field, Ogemaw County, Cranberry Lake, Clare County; (2) new pay discoveries, both Richfield, in North Hamilton field, Clare County, and West Branch field, Ogemaw County; (3) discovery and development of an important Marshall gas reserve in North Hamilton field, and (4) the discovery, extension and development of Ravenna-Traverse oil pool, Muskegon County.

It appears that drilling activity in Michigan during 1953 should show a marked increase over 1952. Some of the areas found in 1952, combined with the current programs of deeper objective wildcatting, now confined to the shallow rim areas of the Michigan basin, should keep the industry busy for at least the first half of the new year.

OHIO

Old Areas Still Dominate Drilling Activity in Ohio

A LARGE part of the drilling in Ohio during the past year was in the Corning-grade oil-producing areas, and, to a large extent, was concentrated in Knox and Coshocton counties.

Outstanding developments included: (1) the expansion of New Castle field with the discovery of several extension areas and a new pool, (2) the development of Mount Zion pool, and (3) the indication of a new pool nearby in Knox County. Several indications of new gas pools in Hocking, Medina, Meigs, Portage, Richland, and Stark counties were found, but none were of sufficient size to warrant extensive development.

Initial reports on the possibility that a major Oriskany gas field appeared to be developing near the West Virginia line apparently were premature as all wells except those in the southern part of Belpre Township were completed dry or nearly so.

BOOK

SEISMIC PROSPECTING FOR OIL. By Charles Hewitt Dix. Published by Harpers & Brothers, New York, November 1952. 414 pp. $7.50.

This is the first book to be devoted exclusively to seismic prospecting. Though written primarily for actual workers in seismic surveying, the aim of the book is entirely educational; its purpose is to train younger men in the interpretive techniques and in the backgrounds necessary to understand these techniques. It will also serve as a review for the older members of the profession. Several chapters of this book have been written for the exploration geologist who desires a better understanding of just how seismic data can help him. The bulk of the book is devoted to a discussion of practical interpretation techniques for both reflection and refraction shooting. It has been assumed that the reader will have had 2 years of college physics and 2 years of college mathematics and will know the descriptive terminology of differential and integral calculus; however, mathematics has been kept as elementary as feasible in each discussion. Illustrations include all mathematical symbols and deductions so that they are of value to students who do not read English.

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Exploratory and Development Drilling—1952

SOUTHWEST TEXAS (District 1)

Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Atascosa	81	9	0	72	240,613
Bandera	2	0	0	2	12,702
Bastrop	15	2	0	13	51,343
Bell	8	1	0	7	9,943
Bexar	21	2	1	18	38,501
Caldwell	16	0	0	16	44,995
Dimmitt	6	1	0	5	30,722
Edwards	4	0	0	4	15,282
Frio	32	0	1	31	165,644
Gillespie	2	0	0	2	1,040
Gonzales	16	0	0	16	77,375
Guadalupe	15	1	0	14	30,801
Karnes	1	0	0	1	4,035
Kenney	3	0	0	3	10,241
Kimble	2	0	0	2	3,420
LaSalle	15	0	0	15	91,047
McMullen	26	3	2	21	154,245
Medina	6	1	0	5	13,650
Milam	13	1	0	12	33,123
Real	1	0	0	1	1,105
Travis	12	0	0	12	18,274
Val Verde	4	0	0	4	22,916
Williamson	16	0	0	16	33,469
Wilson	30	0	0	30	103,641
Zapata	1	0	0	1	4,910
Total	348	21	4	323	1,213,037

SOUTHWEST TEXAS (District 1)

Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Atascosa	97	68	2	27	273,493
Bastrop	7	3	0	4	16,471
Bexar	34	24	1	9	24,456
Bell	1	0	0	1	2,465
Caldwell	102	89	0	13	227,023
Dimmitt	2	1	0	1	10,333
Frio	62	54	1	7	228,487
Gonzales	6	0	0	6	16,765
Guadalupe	46	40	0	6	110,710
Kimble	1	0	0	1	1,455
La Salle	3	1	0	2	12,997
McMullen	13	6	4	3	56,291
Medina	4	0	0	4	2,518
Milam	2	1	0	1	4,307
Travis	14	8	0	6	11,165
Val Verde	2	0	2	0	20,901
Williamson	2	0	0	2	2,422
Wilson	10	3	1	6	44,760
Zavala	2	1	1	0	14,105
Total	410	299	12	99	1,081,134

TEXAS GULF COAST (District 2)

Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Bee	46	7	3	36	279,365
Calhoun	24	3	3	18	201,770
DeWitt	31	2	2	27	250,886
Goliad	51	5	8	38	274,247
Jackson	43	5	4	34	323,296
Karnes	40	2	0	38	252,764
Lavaca	21	5	0	16	158,668
Live Oak	19	3	0	16	90,734
Refugio	28	5	0	23	196,654
Victoria	33	0	2	31	200,904
Total	336	37	22	277	2,229,283

TEXAS GULF COAST (District 2)

Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Bee	73	46	9	18	418,590
Calhoun	19	9	4	6	153,976
DeWitt	63	58	1	4	487,323
Goliad	83	41	10	32	464,069
Jackson	41	21	7	13	289,067
Karnes	19	9	3	7	109,499
Lavaca	14	4	6	4	124,686
Live Oak	48	25	10	13	273,602
Refugio	51	21	22	8	260,394
Victoria	76	45	16	15	466,168
Total	487	279	88	120	3,047,374

TEXAS GULF COAST (District 3)

Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Austin	7	4	0	3	75,719
Brazos	1	0	0	1	3,043
Brazoria	26	4	0	22	221,423
Burleson	2	0	0	2	12,830
Chambers	17	3	2	12	149,919
Colorado	26	5	2	19	250,213
Fayette	15	2	0	13	56,613
Fort Bend	30	5	0	25	215,198
Galveston	22	3	1	18	203,158
Grimes	4	1	0	3	40,894
Hardin	19	5	0	14	164,348
Harris	36	6	1	29	294,106
Jasper	3	0	0	3	23,416
Jefferson	21	8	1	12	198,056
Lee	2	0	0	2	5,810
Liberty	24	6	2	16	206,878
Matagorda	23	2	0	21	203,169
Montgomery	18	2	0	16	121,206
Newton	6	1	1	4	55,632
Orange	14	2	0	12	123,367
Polk	6	3	0	3	42,445
San Jacinto	10	2	1	7	99,011
Tyler	4	0	0	4	39,843
Waller	6	1	0	5	49,359
Washington	7	2	0	5	69,135
Wharton	41	6	3	32	279,909
Total	390	73	14	303	3,204,700

TEXAS GULF COAST (District 3)

Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Austin	32	23	2	7	262,241
Brazoria	109	65	10	34	586,939
Burleson	1	0	0	1	3,478
Chambers	103	54	12	37	684,080
Colorado	36	18	8	10	321,818
Fayette	35	26	1	8	80,611
Fort Bend	122	83	8	31	625,045
Galveston	56	46	1	9	493,555
Grimes	2	1	0	1	22,111
Hardin	138	96	7	35	883,788
Harris	195	147	5	43	1,130,519
Jasper	3	2	0	1	24,423
Jefferson	91	51	13	27	618,322
Liberty	135	105	6	24	987,219
Madison	1	1	0	0	9,240
Matagorda	63	36	8	19	477,921
Montgomery	24	10	4	10	128,377
Newton	18	8	4	6	146,575
Orange	55	38	8	9	375,255
Polk	8	5	0	3	33,255
San Jacinto	6	2	2	2	58,495
Tyler	22	18	0	4	134,053
Waller	13	7	0	6	91,707
Washington	10	3	0	7	64,188
Wharton	91	52	11	28	443,669
Total	1,369	897	110	362	8,486,884

SOUTHWEST TEXAS (District 4)

Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Aransas	28	4	6	18	248,982
Brooks	9	2	1	6	71,191
Cameron	2	0	0	2	24,067
Duval	87	9	4	74	472,260
Hidalgo	26	6	7	13	190,983
Jim Hogg	46	1	0	45	182,732
Jim Wells	39	7	3	29	204,108
Kenedy	18	3	5	10	281,914
Kleberg	4	2	1	1	13,748
Nueces	35	6	4	25	320,676
San Patricio	41	10	2	29	149,256
Starr	58	7	2	49	190,277
Webb	59	8	3	48	152,685
Willacy	6	1	1	4	61,749
Zapata	34	1	1	32	107,917
Total	492	67	40	385	2,672,545

SOUTHWEST TEXAS (District 4)

Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Aransas	69	49	7	13	594,437
Brooks	37	27	2	8	183,033
Duval	163	99	14	50	593,159
Hidalgo	33	14	12	7	265,266
Jim Hogg	13	7	0	6	47,703
Jim Wells	104	66	15	23	560,468
Kenedy	7	2	0	5	58,788
Kleberg	29	24	4	1	307,691
Nueces	168	115	26	27	1,302,933
San Patricio	195	147	23	25	1,018,400
Starr	142	86	6	50	540,428
Webb	83	45	1	37	167,752
Willacy	25	18	3	4	149,529
Zapata	42	31	2	9	71,957
Total	1,110	730	115	265	5,861,544

EAST TEXAS (Districts 5 and 6)

Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Anderson	7	1	0	6	46,134
Angelina	11	1	0	10	58,900
Bowie	7	1	0	6	31,577
Camp	2	0	0	2	14,133
Cass	2	0	0	2	15,599
Cherokee	13	1	1	11	78,623
Collin	2	0	0	2	16,785
Ellis	1	0	0	1	1,025
Falls	3	0	0	3	7,296
Fannin	6	0	0	6	24,181
Franklin	1	0	0	1	4,940
Freestone	4	1	1	2	34,813
Gregg	2	1	0	1	14,670
Harrison	11	3	1	7	75,256
Henderson	7	1	0	6	37,809
Hill	6	0	0	6	14,000
Hopkins	5	0	0	5	27,309
Houston	5	1	0	4	41,659
Hunt	14	1	0	13	57,067
Kaufman	18	2	0	16	92,459
Lamar	7	0	0	7	18,707
Leon	5	0	1	4	34,251
Limestone	6	0	0	6	23,364
Marion	2	2	0	0	14,156
McLennan	4	0	0	4	8,667
Morris	1	0	0	1	4,700
Nacogdoches	3	0	0	3	24,304
Navarro	16	1	0	15	63,147
Panola	2	0	0	2	13,520
Rains	1	0	0	1	12,490
Red River	4	0	0	4	9,940
Robertson	1	0	0	1	3,097
Rusk	2	0	0	2	9,583
Sabine	1	0	0	1	6,600
Shelby	3	0	0	3	21,816
Smith	13	1	0	12	83,495
Tarrant	1	0	0	1	7,126
Titus	5	1	0	4	30,375
Upshur	6	0	0	6	35,241
Van Zandt	4	0	0	4	29,550
Wood	38	6	0	32	220,290
Total	252	25	4	223	1,368,654

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FIG 100
1000 p.s.i. TEST
SIZES: 2", 2½", 3", 4", 6", 8"

FIG. 200
2000 p.s.i. TEST
SIZES: 1", 1¼", 1½", 2", 2½" 3", 4", 6", 8"

FIG 400
4000 p.s.i. TEST
SIZES: 2", 2½", 3", 4", 5½" O.D., 6", 7" O.D., 8", 10"

FIG 600
6000 p.s.i. TEST
SIZES: 1", 1½", 2", 2½", 3", 4"

FIG. 602
6000 p.s.i. TEST
SIZES: 1", 1½", 2", 3", 4"

FIG 1502
15,000 p.s.i. TEST
SIZES: 2", 2½", 3"

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EAST TEXAS
(Districts 5 and 6)
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Anderson	36	30	1	5	339,257
Angelina	3	0	0	3	12,914
Bowie	3	0	0	3	17,632
Cass	1	0	0	1	5,985
Cherokee	12	5	0	7	55,962
East Tex. Field	56	49	1	6	205,360
Falls	1	1	0	0	1,314
Franklin	4	2	0	2	30,951
Freestone	10	4	4	2	82,038
Gregg	18	6	11	1	119,200
Harrison	55	36	8	11	354,658
Henderson	8	5	2	1	70,413
Hill	4	0	0	4	5,014
Hopkins	31	29	0	2	240,044
Houston	4	3	0	1	23,395
Hunt	1	0	0	1	4,410
Kaufman	45	32	0	13	173,230
Leon	13	5	2	6	83,696
Limestone	10	3	3	4	70,750
Marion	5	5	0	0	33,702
Nacogdoches	9	4	5	0	74,548
Navarro	22	11	0	11	96,500
Panola	34	14	17	3	218,595
Rains	1	1	0	0	13,493
Rusk	3	2	0	1	14,478
Shelby	3	0	1	2	18,470
Smith	11	6	1	4	83,883
Titus	8	6	0	2	35,299
Van Zandt	6	5	0	1	10,759
Wood	116	93	0	23	590,258
Total	533	357	56	120	3,086,208

WEST CENTRAL TEXAS
(District 7-B)
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Brown	42	32	0	10	57,146
Callahan	64	36	1	27	181,527
Coleman	192	142	4	46	577,353
Comanche	3	3	0	0	7,969
Eastland	45	17	2	26	138,601
Fisher	55	41	0	14	283,635
Hamilton	4	0	2	2	11,931
Haskell	104	73	0	31	448,035
Jones	215	159	0	56	659,700
Nolan	37	31	0	6	217,038
Palo Pinto	35	19	0	16	54,323
Parker	17	14	1	2	63,456
Shackelford	115	61	2	52	212,694
Stephens	74	42	4	28	206,521
Stonewall	165	139	0	26	856,316
Taylor	79	52	0	27	309,418
Throckmorton	54	28	0	26	189,808
Total	1,300	889	16	395	4,475,471

WEST CENTRAL TEXAS
(District 7-B)
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Brown	33	12	1	20	46,826
Callahan	82	13	1	68	232,130
Coleman	177	35	2	140	475,901
Comanche	8	1	0	7	21,123
Eastland	76	16	3	57	233,217
Erath	7	0	0	7	26,493
Fisher	33	4	0	29	190,258
Hamilton	1	0	0	1	3,920
Haskell	62	9	0	53	287,059
Hood	1	0	0	1	5,082
Jones	160	29	0	131	509,860
Lampasas	2	0	0	2	5,888
Mills	3	0	0	3	4,197
Nolan	24	7	0	17	153,109
Palo Pinto	45	6	3	36	90,753
Parker	9	0	0	9	32,245
San Saba	1	0	0	1	1,100
Shackelford	66	15	0	51	117,123
Stephens	81	24	5	52	281,372
Stonewall	40	8	0	32	241,222
Taylor	57	13	0	44	224,439
Throckmorton	67	24	0	43	295,536
Total	1,035	216	15	804	3,478,853

WEST TEXAS
(Districts 8 and 7-C)
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Andrews	45	18	0	27	399,269
Bailey	1	0	0	1	8,953
Borden	19	1	0	18	157,375
Brewster	1	0	0	1	7,514
Cochran	11	2	0	9	93,686
Coke	13	4	0	11	91,522
Concho	9	0	0	9	30,539
Cottle	2	0	0	2	12,175
Crane	18	7	1	10	127,313
Crockett	48	4	1	43	230,992
Crosby	5	0	0	5	33,598
Culberson	7	0	0	7	49,675
Dawson	15	4	0	11	134,696
Dickens	2	0	0	2	15,399
Ector	13	4	0	9	122,288
Edwards	1	0	0	1	5,312
El Paso	1	0	0	1	2,010
Floyd	2	1	0	1	15,627
Gaines	27	6	0	21	207,058
Garza	16	2	0	14	72,356
Glasscock	22	1	0	21	148,813
Hale	1	0	0	1	6,815
Hockley	5	1	0	4	42,656
Howard	15	6	0	9	107,062
Hudspeth	2	0	0	2	7,886
Irion	12	3	0	9	56,663
Kent	15	2	0	13	102,311
Kimble	8	0	0	8	21,681
King	17	3	0	14	94,773
Lamp	1	0	0	1	9,315
Loving	8	1	0	7	32,310
Lubbock	1	0	0	1	4,505
Lynn	8	2	0	6	69,856
McCulloch	6	0	0	6	7,412
Martin	12	4	0	8	112,624
Menard	7	0	0	7	19,464
Midland	13	4	0	9	143,947
Mitchell	8	0	0	8	53,421
Pecos	59	5	4	50	226,930
Presidio	1	0	0	1	7,837
Reagan	33	11	0	22	235,691
Reeves	9	0	0	9	29,738
Runnels	137	36	0	101	562,700
Schleicher	33	1	1	31	200,760
Scurry	13	5	0	8	96,747
Sterling	14	3	0	11	69,633
Sutton	20	1	2	17	118,550
Terrell	2	0	0	2	14,705
Terry	8	2	0	6	79,700
Tom Green	56	6	0	50	216,060
Upton	28	11	0	17	255,563
Ward	14	1	0	13	52,258
Winkler	12	4	0	8	70,383
Yoakum	12	1	0	11	113,973
Total	870	167	9	694	5,210,645

WEST TEXAS
(Districts 8 and 7-C)
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Andrews	204	175	5	24	1,166,488
Borden	52	41	0	11	368,942
Cochran	188	182	0	6	945,904
Coke	104	94	0	10	594,981
Concho	1	0	0	1	3,880
Crane	55	44	1	10	244,360
Crockett	103	71	0	32	351,177
Dawson	23	15	0	8	181,689
Ector	245	235	0	10	1,537,032
Gaines	127	115	1	11	832,509
Garza	49	45	0	4	144,737
Glasscock	245	238	0	7	1,753,873
Hale	7	6	0	1	43,193
Hockley	49	46	0	3	259,381
Howard	76	65	0	11	374,231
Irion	15	5	0	10	50,398
Kent	80	68	0	12	470,394
Kimble	2	1	0	1	2,881
King	28	26	0	2	144,547
Loving	61	48	0	13	227,445
Lubbock	8	6	0	2	46,599
McCulloch	1	1	0	0	219
Martin	6	4	0	2	67,215
Midland	493	476	0	17	3,804,845
Mitchell	13	13	0	0	22,396
Pecos	187	143	2	42	438,530
Reagan	268	259	0	9	1,991,283
Reeves	7	6	0	1	21,189
Runnels	281	239	2	40	1,179,076
Schleicher	39	32	2	5	228,648
Scurry	219	201	0	18	1,221,051
Sterling	21	12	0	9	66,182
Sutton	4	0	3	1	13,949
Terry	34	30	0	4	297,918
Tom Green	47	24	0	23	133,683
Upton	554	541	0	13	4,226,272
Ward	82	65	0	17	217,039
Winkler	27	20	3	4	109,801
Yoakum	69	63	0	6	394,853
Total	4,075	3,656	19	400	24,178,781

NORTH CENTRAL TEXAS
(District 9)
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Archer	257	38	0	219	625,943
Baylor	27	3	0	24	120,155
Clay	68	13	0	55	287,235
Cooke	79	14	0	65	229,252
Denton	11	0	0	11	24,079
Foard	2	0	0	2	14,967
Grayson	23	3	0	20	146,761
Hardeman	1	0	0	1	8,040
Jack	162	33	7	122	613,284
Knox	26	3	0	23	144,175
Montague	96	37	0	59	565,657
Wichita	41	13	0	28	107,726
Wilbarger	79	16	0	63	191,920
Wise	12	4	2	6	68,422
Young	164	35	2	127	436,845
Total	1,048	212	11	825	3,584,461

NORTH CENTRAL TEXAS
(District 9)
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Archer	363	202	0	161	819,360
Baylor	35	27	0	8	118,777
Clay	167	100	0	67	696,318
Cooke	138	100	0	38	379,804
Denton	20	20	0	0	32,513
Foard	3	1	1	1	13,599
Grayson	106	93	0	13	631,689
Jack	332	240	8	84	1,236,961
Knox	27	21	0	6	120,446
Montague	211	167	0	44	1,150,697
Wichita	300	202	0	98	722,366
Wilbarger	188	127	0	61	401,011
Wise	17	12	3	2	74,999
Young	250	162	1	87	750,232
Total	2,157	1,474	13	670	7,148,772

TEXAS PANHANDLE
(District 10)
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Armstrong	7	0	0	7	42,655
Briscoe	2	0	0	2	15,704
Carson	1	0	0	1	4,910
Childress	3	0	0	3	17,433
Collingsworth	1	0	0	1	5,516
Deaf Smith	1	0	0	1	7,510
Donley	3	0	0	3	16,611
Gray	13	1	3	9	57,451
Hall	1	0	0	1	7,342
Hansford	1	0	0	1	4,090
Hartley	14	1	0	13	70,043
Hemphill	1	0	0	1	13,500
Hutchinson	2	0	2	0	14,830
Lipscomb	1	0	0	1	3,230
Ochiltree	4	1	0	3	36,637
Oldham	1	0	0	1	6,333
Parmer	1	0	0	1	9,720
Potter	1	0	0	1	6,847
Roberts	11	2	1	8	81,653
Sherman	1	0	1	0	6,541
Swisher	2	0	0	2	18,239
Wheeler	8	0	0	8	34,705
Total	80	5	7	68	481,700

TEXAS PANHANDLE
(District 10)
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Armstrong	1	0	0	1	1,375
Carson	49	26	11	12	147,972
Collingsworth	23	2	15	6	48,087
Gray	166	87	63	16	444,338
Hansford	5	0	5	0	15,389
Hartley	4	0	4	0	14,332
Hutchinson	161	143	13	5	519,551
Moore	49	7	37	5	154,221
Ochiltree	2	0	0	2	17,970
Oldham	1	0	0	1	4,915
Potter	12	0	11	1	33,344
Roberts	1	1	0	0	4,136

	Comp.	Oil	Gas	Dry	Footage
Sherman	48	1	43	4	168,917
Wheeler	31	7	21	3	66,356
Total	553	274	223	56	1,640,903

SOUTHEAST NEW MEXICO
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Chaves	16	0	0	16	95,858
Eddy	35	8	0	27	96,103
Lea	84	38	2	44	764,026
Roosevelt	6	1	0	5	37,724
Total	141	47	2	92	993,711

SOUTHEAST NEW MEXICO
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Chaves	3	1	0	2	16,683
Eddy	120	88	0	32	259,046
Lea	440	383	16	41	3,237,060
Roosevelt	2	0	0	2	9,658
Total	565	472	16	77	3,522,447

NORTH LOUISIANA
Wildcat Completions by Parishes

	Comp.	Oil	Gas	Dry	Footage
Bienville	3	0	1	2	17,289
Bossier	16	2	1	13	91,086
Caddo	10	1	0	9	49,022
Caldwell	3	0	0	3	15,024
Catahoula	24	5	0	19	138,884
Claiborne	7	1	0	6	51,510
Concordia	40	1	0	39	281,205
DeSoto	7	1	1	5	26,922
Franklin	6	0	0	6	29,661
Grant	4	0	1	3	23,473
Jackson	2	0	0	2	15,537
LaSalle	7	1	0	6	40,652
Lincoln	4	0	1	3	37,316
Madison	3	0	0	3	15,671
Morehouse	8	0	0	8	36,621
Natchitoches	3	0	0	3	17,309
Ouachita	6	0	1	5	46,694
Red River	7	0	0	7	32,784
Richland	2	0	0	2	14,720
Sabine	11	0	0	11	55,409
Tensas	2	1	0	1	17,967
Union	7	1	1	5	42,548
Webster	5	2	0	3	26,708
Winn	8	0	0	8	37,188
Total	195	16	7	172	1,161,200

NORTH LOUISIANA
Development Completions by Parishes

	Comp.	Oil	Gas	Dry	Footage
Bienville	13	7	4	2	83,792
Bossier	48	12	25	11	238,035
Caddo	529	427	21	81	1,059,705
Caldwell	1	0	0	1	7,517
Catahoula	23	5	2	16	138,003
Claiborne	43	27	7	9	312,779
Concordia	56	30	0	26	357,843
DeSoto	40	15	5	20	116,710
Franklin	1	0	0	1	3,809
Grant	5	0	0	5	22,200
LaSalle	81	42	2	37	284,847
Lincoln	25	8	10	7	174,032
Madison	1	0	0	1	3,817
Morehouse	4	0	1	3	17,486
Natchitoches	1	1	0	0	1,282
Ouachita	4	0	1	3	21,555
Rapides	2	0	0	2	11,406
Red River	20	6	1	13	63,620
Richland	26	8	1	17	76,532
Sabine	17	5	0	12	46,848
Tensas	4	2	1	1	30,862
Union	64	0	50	14	147,450
Webster	90	67	1	22	417,229
Winn	11	5	0	6	16,457
Total	1,109	667	132	310	3,653,816

SOUTH LOUISIANA
Wildcat Completions by Parishes

	Comp.	Oil	Gas	Dry	Footage
Acadia	12	4	0	8	118,550
Allen	9	3	0	6	98,958
Assumption	5	1	0	4	67,434
Ascension	1	0	0	1	12,053
Avoyelles	6	1	0	5	64,875
Beauregard	13	2	0	11	125,555
Calcasieu	13	2	1	10	133,774
Cameron	8	4	0	4	91,690
E. Baton Rouge	3	0	0	3	34,760
E. Feliciana	1	0	0	1	10,505
Evangeline	4	0	0	4	32,259
Iberville	6	2	0	4	63,892
Iberia	1	0	0	1	16,000
Jefferson	3	1	1	1	25,992
Jeff Davis	3	0	0	3	29,544
Lafourche	9	3	0	6	113,989
Livingston	8	1	2	5	71,749
Orleans	2	1	0	1	21,065
Plaquemines	32	7	1	24	346,273
Pointe Coupee	5	0	0	5	53,861
Rapides	7	1	0	6	56,196
St. Bernard	4	0	0	4	38,582
St. John the Baptist	2	0	0	2	24,873
St. Charles	4	1	1	2	44,870
St. Helena	2	0	0	2	21,004
St. James	2	0	0	2	21,300
St. Landry	7	1	1	5	82,153
St. Mary	4	1	0	3	48,791
St. Martin	5	1	0	4	65,860
St. Tammany	1	0	0	1	11,143
Terrebonne	14	3	1	10	180,602
Vermilion	5	0	1	4	56,812
Washington	2	0	0	2	19,265
W. Baton Rouge	3	2	0	1	32,319
Total	206	42	9	155	2,236,573

SOUTH LOUISIANA
Development Completions by Parishes

	Comp.	Oil	Gas	Dry	Footage
Acadia	65	41	4	20	373,835
Allen	7	2	0	5	49,628
Ascension	11	7	0	4	89,646
Assumption	13	4	2	7	117,463
Avoyelles	1	0	0	1	9,468
Beauregard	11	4	0	7	106,810
Calcasieu	51	33	3	15	411,119
Cameron	43	24	4	15	372,402
E. Baton Rouge	9	8	0	1	89,427
Evangeline	9	7	0	2	82,016
Iberia	46	33	3	10	512,230
Iberville	25	22	0	3	220,431
Jefferson	29	18	2	9	336,342
Jeff Davis	15	8	3	4	156,428
Lafayette	4	3	0	1	37,928
Lafourche	123	82	7	34	1,344,340
Livingston	5	1	0	4	50,470
Plaquemines	141	99	4	38	1,404,281
Pointe Coupee	16	12	2	2	166,448
Rapides	6	1	0	5	46,654
St. Bernard	1	0	0	1	10,004
St. Charles	15	8	2	5	133,110
St. James	13	10	0	3	85,518
St. John the Baptist	4	0	1	3	41,344
St. Landry	25	11	6	8	264,323
St. Martin	54	39	4	11	590,075
St. Mary	33	17	3	13	377,018
St. Tammany	1	0	0	1	7,000
Terrebonne	76	55	5	16	825,590
Vermilion	18	9	3	6	151,718
Washington	2	2	0	0	18,031
W. Baton Rouge	3	1	0	2	39,805
Total	875	561	58	256	8,009,962

ARKANSAS
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Ashley	6	0	0	6	21,076
Bradley	2	0	0	2	7,765
Calhoun	6	2	0	4	16,957
Clark	1	0	0	1	1,503
Clay	2	0	0	2	2,075
Cleveland	1	0	0	1	1,829
Columbia	10	1	0	9	73,505
Crittenden	2	0	0	2	8,522
Cross	4	0	0	4	8,977
Hempstead	4	0	0	4	13,541
Lafayette	9	2	0	7	55,272
Miller	11	1	0	10	64,488
Nevada	7	0	0	7	31,219
Ouachita	16	1	0	15	40,755
Prairie	2	0	0	2	2,450
Union	14	4	0	10	77,518
Total	97	11	0	86	427,452

ARKANSAS
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Calhoun	22	17	0	5	84,177
Columbia	51	32	0	19	217,419
Lafayette	28	15	0	13	108,838
Miller	29	16	0	13	110,017
Nevada	24	14	0	10	51,914
Ouachita	34	18	0	16	97,714
Union	142	94	7	41	521,329
Total	330	208	7	117	1,161,408

KANSAS
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Barber	17	3	0	14	85,252
Barton	65	10	1	54	236,008
Brown	1	0	0	1	2,600
Butler	45	2	0	43	128,574
Chase	3	0	0	3	7,460
Cheyenne	4	0	0	4	21,374
Clark	12	0	2	10	70,994
Cowley	37	5	0	32	118,107
Decatur	20	4	0	16	82,097
Dickinson	2	0	0	2	5,456
Edwards	4	0	0	4	19,218
Ellis	59	7	0	52	220,319
Ellsworth	11	3	0	8	37,051
Finney	3	1	0	2	15,291
Ford	5	0	0	5	27,021
Franklin	1	0	0	1	1,410
Geary	3	0	0	3	7,185
Gove	15	2	0	13	68,281
Graham	63	7	0	56	252,707
Grant	1	0	0	1	4,874
Greenwood	11	0	0	11	24,436
Harper	4	1	0	3	20,125
Harvey	2	0	0	2	5,785
Hodgeman	18	0	0	18	86,060
Jackson	1	0	0	1	3,603
Jewell	3	0	0	3	11,904
Keith	1	0	0	1	3,040
Kingman	6	2	0	4	26,402
Kiowa	1	0	0	1	5,110
Lane	5	1	0	4	23,620
Lincoln	1	0	0	1	3,820
Logan	6	0	0	6	28,096
Lyon	6	0	0	6	16,280
McPherson	15	0	0	15	53,501
Marion	9	1	0	8	23,464
Meade	13	2	7	4	80,133
Mitchell	1	0	0	1	3,985
Morton	3	0	1	2	15,794
Ness	7	0	0	7	31,827
Norton	15	0	0	15	57,585
Osage	2	0	0	2	4,373
Osborne	9	1	0	8	33,447
Pawnee	11	2	0	9	43,349
Phillips	13	0	0	13	48,047
Pratt	18	0	2	16	82,547
Reno	13	0	0	13	52,254
Rice	23	2	0	21	78,355
Rooks	49	9	0	40	175,170
Rush	16	2	0	14	61,312
Russell	18	0	0	18	57,599
Saline	12	2	0	10	39,625
Scott	4	0	0	4	18,611
Sedgwick	13	2	0	11	46,237
Seward	4	0	1	3	26,706
Sheridan	16	1	0	15	72,503
Sherman	1	0	0	1	5,573
Smith	1	0	0	1	3,900
Stafford	52	12	3	37	205,401
Stanton	1	0	0	1	6,432
Sumner	24	1	0	23	102,926
Thomas	3	0	0	3	14,374
Trego	35	3	0	32	146,565
Wabaunsee	2	0	0	2	6,790
Wallace	3	0	0	3	15,865
Wichita	1	0	0	1	5,100
Woodson	2	2	0	0	3,132
Total	845	90	17	738	3,292,042

KANSAS
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Barber	27	16	6	5	112,338
Barton	502	288	2	212	1,768,300
Butler	333	218	0	105	876,675
Chase	1	1	0	0	2,514
Clark	1	1	0	0	4,800
Clay	4	2	0	2	7,571
Coffey	13	7	0	6	30,068

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	Comp.	Oil	Gas	Dry	Footage
Cowley	232	124	3	105	734,265
Decatur	21	16	0	5	82,060
Dickinson	5	3	0	2	11,748
Edwards	5	1	2	2	20,456
Ellis	264	160	0	104	960,905
Ellsworth	80	35	0	45	264,629
Finney	66	1	64	1	155,772
Gove	4	2	0	2	17,984
Graham	101	45	0	56	381,650
Grant	31	0	31	0	82,778
Greenwood	94	60	0	34	191,317
Hamilton	6	0	6	0	15,681
Harper	1	0	0	1	4,020
Harvey	7	4	0	3	24,236
Haskell	27	0	26	1	74,126
Hodgeman	7	1	0	6	32,259
Kearny	85	1	83	1	226,298
Kingman	20	12	1	7	81,191
Lane	1	0	0	1	4,436
Lyon	15	6	0	9	33,186
McPherson	20	6	1	13	61,591
Marion	32	16	0	16	81,274
Meade	30	22	2	6	100,848
Morris	4	3	0	1	9,000
Morton	29	0	28	1	76,083
Nemaha	1	0	0	1	3,629
Ness	4	3	0	1	17,745
Norton	6	1	0	5	23,085
Osborne	11	11	0	0	38,048
Pawnee	33	17	8	8	130,958
Phillips	48	41	0	7	158,801
Pratt	80	57	1	22	348,058
Reno	17	11	0	6	64,676
Rice	225	134	0	91	734,731
Rooks	244	137	0	107	880,794
Rush	11	7	0	4	40,899
Russell	373	270	3	100	1,063,032
Saline	71	62	0	9	227,015
Scott	2	1	0	1	8,052
Seward	12	1	10	1	40,735
Sedgwick	35	21	0	14	119,151
Sheridan	3	0	0	3	11,892
Stafford	285	155	2	128	1,057,684
Stanton	6	0	6	0	14,701
Stevens	14	0	14	0	37,465
Sumner	56	31	0	25	217,592
Trego	74	55	0	19	302,226
Wabaunsee	2	1	0	1	6,360
Woodson	55	37	0	18	90,397
Total	3,726	2,104	299	1,323	12,227,785

MISSOURI
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Clinton	7	0	3	4	3,147
Perry	1	0	0	1	1,943
Platte	1	0	0	1	1,508
Vernon	1	0	0	1	1,205
Total	10	0	3	7	8,203

MISSOURI
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
De Kalb	4	0	0	4	5,151
Holt	4	0	3	1	4,336
Total	8	0	3	5	9,487

EAST NEBRASKA
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Cass	2	0	0	2	17,940
Chase	1	0	0	1	6,134
Cherry	5	0	0	5	8,104
Dawson	1	0	0	1	3,788
Dundy	1	0	0	1	5,233
Franklin	1	0	0	1	4,140
Frontier	1	0	0	1	3,392
Furnas	1	0	0	1	3,833
Gage	1	0	0	1	2,894
Hall	2	0	0	2	7,695
Harlan	5	0	0	5	12,236
Hayes	1	0	0	1	4,266
Hooker	1	0	0	1	3,970
Keith	2	0	0	2	7,587
Lancaster	1	0	0	1	1,906
Lincoln	1	0	0	1	2,834
Logan	1	0	0	1	3,935
Loup	1	0	0	1	3,198
Otoe	2	0	0	2	
Perkins	1	0	0	1	3,274
Red Willow	2	0	0	2	7,465
Richardson	8	0	0	8	9,449
Webster	1	0	0	1	4,286
Total	43	0	0	43	127,469
Field wells:					
Harlan	2	2	0	0	7,102
Richardson	5	5	0	0	11,482
Total	7	7	0	0	18,584

WESTERN NEBRASKA
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Banner	2	1	0	1	12,193
Cheyenne	50	35	1	14	265,500
Deuel	5	0	4	1	17,647
Kimball	59	45	0	14	531,536
Total	116	81	5	30	626,876

WESTERN NEBRASKA
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Banner	7	1	0	6	46,073
Box Butte	4	0	0	4	15,042
Chase	6	0	0	6	20,874
Cherry	9	0	0	9	36,873
Cheyenne	55	6	5	44	262,746
Dawes	5	0	0	5	12,431
Dawson	1	0	0	1	3,258
Deuel	3	0	0	3	11,302
Dundy	3	0	0	3	15,829
Gage	1	0	0	1	2,802
Garden	4	0	0	4	16,749
Grant	1	0	0	1	3,824
Hall	2	0	0	2	7,695
Hooker	1	0	0	1	3,970
Keith	3	0	0	3	11,962
Kimball	13	4	0	9	88,525
Lincoln	2	0	0	2	7,570
Logan	1	0	0	1	3,934
Morrill	10	1	0	9	43,496
Perkins	1	0	0	1	3,274
Red Willow	2	0	0	2	7,465
Scottsbluff	3	0	0	3	15,875
Sheridan	5	0	0	5	16,719
Sioux	2	0	0	2	9,680
Total	144	12	5	127	667,968

IOWA
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Decatur	1	0	0	1	2,335
Total	1	0	0	1	2,335

MISSISSIPPI
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Adams	50	12	1	37	329,909
Amite	2	1	0	1	19,901
Attala	1	0	0	1	8,018
Carroll	2	0	0	2	8,716
Chickasaw	2	0	0	2	8,511
Choctaw	1	0	0	1	4,385
Clark	1	0	0	1	5,009
Copiah	1	0	0	1	6,709
Covington	1	0	0	1	5,017
Forrest	3	1	0	2	26,819
Franklin	22	2	0	20	166,108
Grun	1	0	0	1	8,566
Hancock	2	0	0	2	22,189
Hinds	2	0	0	2	18,232
Holmes	1	0	0	1	4,645
Jasper	3	0	0	3	29,545
Jefferson	12	2	0	10	80,932
Jones	4	0	0	4	36,667
Lauderdale	1	0	0	1	4,518
Leake	1	0	0	1	9,408
Laflore	2	0	0	2	12,593
Lincoln	5	0	0	5	47,287
Marion	1	0	0	1	10,517
Madison	5	0	0	5	23,838
Monroe	4	1	0	3	18,264
Montgomery	1	0	0	1	4,564
Pearl River	4	0	0	4	37,669
Perry	2	0	0	2	21,678
Rankin	2	1	0	1	27,980
Scott	1	0	0	1	9,810
Smith	1	0	0	1	8,417
Stone	1	0	0	1	8,522
Union	1	0	0	1	2,740
Warren	2	0	0	2	19,065
Washington	1	0	0	1	3,602
Wayne	11	2	0	9	82,323
Wilkinson	22	3	0	19	165,937
Winston	1	0	0	1	4,571
Yazoo	2	0	0	2	13,664
Total	182	25	1	156	1,326,709

MISSISSIPPI
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Adams	82	40	0	42	368,784
Forrest	2	2	0	0	16,914
Franklin	22	10	0	12	81,995
Jasper	3	2	0	1	13,772
Jefferson	14	7	1	6	72,827
Jones	1	1	0	0	6,658
Lamar	3	2	0	1	27,098
Lincoln	10	7	0	3	107,489
Marion	5	3	1	1	43,437
Pearl River	1	1	0	0	9,036
Wayne	8	7	0	1	48,544
Wilkinson	9	4	1	4	79,784
Yazoo	6	0	0	6	35,484
Total	166	86	3	77	1,113,822

ALABAMA
Wildcat Completions by Counties

	Comp:	Oil	Gas	Dry	Footage
Baldwin	2	0	0	2	11,154
Blount	1	0	0	1	1,122
Butler	1	0	0	1	9,480
Clarke	2	0	0	2	11,005
Conecuh	2	0	0	2	10,910
Covington	2	0	0	2	4,011
Cullman	1	0	0	1	2,085
Escambia	12	5	0	7	63,364
Franklin	2	1	0	1	2,963
Henry	1	0	0	1	6,394
Marion	1	0	1	0	1,820
Mobile	4	0	0	4	22,105
Monroe	3	0	0	3	20,682
Washington	5	0	0	5	30,112
Wilcox	1	0	0	1	7,514
Totals	40	6	1	33	204,721

ALABAMA
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Choctau	4	2	0	2	23,244
Clarke	1	1	0	0	15,729
Escambia	27	21	0	6	168,280
Total	32	24	0	8	207,253

FLORIDA
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Collier	2	0	0	2	8,415
Escambia	1	0	0	1	6,992
Hindry	1	0	0	1	11,794
Okaloosa	1	0	0	1	6,324
Santa Rosa	3	0	0	3	20,153
Suwanee	1	0	0	1	3,682
Walton	1	0	0	1	5,204
Total	10	0	0	10	62,564

OKLAHOMA
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Atoka	2	0	0	2	1,685
Beaver	19	5	2	12	139,003
Beckham	7	0	2	5	49,902
Bryan	3	0	0	3	13,587
Caddo	3	0	0	3	22,562
Canadian	1	1	0	0	11,700
Carter	27	2	1	24	122,151
Choctaw	1	0	0	1	1,634
Cimarron	2	0	0	2	9,788
Cleveland	16	6	0	10	129,727
Coal	3	2	0	1	16,285
Comanche	12	0	0	12	31,893
Cotton	20	0	0	20	93,755
Creek	13	2	0	11	240,300
Ellis	1	1	0	0	9,806
Garfield	12	1	1	10	49,943
Garvin	25	6	0	19	152,946
Grady	1	1	0	0	10,012

	Comp.	Oil	Gas	Dry	Footage
Grant	19	1	0	18	107,689
Greer	4	0	0	4	15,724
Harmon	1	0	0	1	8,029
Harper	4	1	0	3	30,902
Haskell	1	0	1	0	7,483
Hughes	10	3	1	6	32,977
Jackson	9	1	0	8	11,077
Jefferson	21	0	0	21	84,436
Johnston	3	0	0	3	2,907
Kay	27	4	0	23	102,541
Kingfisher	1	0	0	1	6,512
Kiowa	7	0	0	8	35,287
LeFlore	1	0	0	1	7,650
Lincoln	108	13	2	93	516,333
Logan	39	4	0	35	224,966
Love	16	2	0	14	101,962
McClain	7	2	0	5	66,621
McIntosh	2	0	0	2	6,799
Major	1	0	1	0	11,861
Marshall	5	0	0	5	26,669
Murray	10	1	0	9	16,297
Muskogee	1	0	0	1	2,496
Noble	32	5	0	27	141,916
Okfuskee	15	3	0	12	57,002
Oklahoma	12	2	1	9	73,444
Okmulgee	8	5	0	3	17,856
Osage	37	10	0	27	99,644
Pawnee	15	1	0	14	50,859
Payne	42	11	0	31	190,927
Pittsburgh	4	0	1	3	19,976
Pontotoc	19	2	0	17	40,804
Pottawatomie	21	3	0	18	119,172
Pushmataha	3	0	0	3	3,402
Roger Mills	1	0	0	1	14,511
Seminole	8	3	0	5	28,986
Stephens	28	3	0	25	136,620
Texas	3	0	0	3	19,401
Tillman	5	0	0	5	16,116
Tulsa	1	1	0	0	1,885
Washita	8	0	0	8	78,607
Woods	3	0	0	3	22,149
Total	730	108	13	609	3,452,174

OKLAHOMA
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Beaver	6	2	1	3	38,203
Beckham	59	51	6	2	584,602
Bryan	7	6	1	0	25,391
Caddo	49	32	5	12	180,771
Carter	390	323	3	64	1,744,287
Cleveland	29	18	0	11	218,494
Coal	8	7	0	1	54,941
Comanche	72	30	1	41	59,978
Cotton	58	23	0	35	93,719
Creek	383	222	4	157	970,513
Garfield	39	17	3	19	148,152
Garvin	267	195	1	71	1,638,792
Grady	37	24	5	8	176,902
Grant	31	15	0	16	178,131
Greer	1	0	0	1	2,501
Harper	1	0	1	0	7,311
Hughes	124	52	14	58	345,988
Jackson	10	5	0	5	24,424
Jefferson	71	37	3	31	116,944
Kay	103	53	3	47	366,548
Kingfisher	4	3	0	1	27,252
Kiowa	14	9	0	5	33,900
Lincoln	342	192	5	145	1,390,882
Logan	121	74	2	45	631,368
Love	4	3	0	1	25,160
McClain	18	10	0	8	161,527
McIntosh	2	0	0	2	6,920
Major	6	6	0	0	41,728
Marshall	26	20	0	6	68,412
Murray	1	0	0	1	2,020
Muskogee	16	3	0	13	26,294
Noble	124	77	2	45	492,128
Oklahoma	87	71	3	13	527,365
Okfuskee	124	49	2	73	351,794
Okmulgee	206	94	3	109	393,592
Osage	401	213	0	188	856,292
Pawnee	124	69	0	55	320,782
Payne	173	95	2	76	629,903
Pontotoc	257	168	23	66	491,425
Pottawatomie	160	88	2	70	647,864
Seminole	208	106	6	96	669,098
Stephens	666	501	14	151	2,672,006
Texas	174	0	164	10	493,135
Tillman	4	2	0	2	8,163
Wagoner	21	5	0	16	35,533
Washington	1	0	0	1	1,560
Washita	22	8	3	11	195,828
Total	5,051	2,978	282	1,791	18,168,723

EASTERN KENTUCKY
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Elliott	2	0	0	2	2,740
Greenup	2	0	0	2	2,878
Rowan	1	0	0	1	912
Wolfe	1	0	0	1	1,355
Total	6	0	0	6	7,885

TENNESSEE
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Clay	24	0	0	24	18,154
Fentress	2	0	0	2	3,150
Jackson	17	3	0	14	7,260
Morgan	2	0	0	2	2,320
Overton	3	0	0	3	1,465
Putnam	2	0	1	1	1,645
Robertson	1	0	1	0	1,650
Scott	1	0	0	1	1,650
Smith	1	0	0	1	230
Sumner	4	0	1	3	2,048
Total	57	3	3	51	39,572

TENNESSEE
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Jackson	1	0	0	1	250

ILLINOIS
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Alexander	2	0	0	2	2,905
Bond	20	0	0	20	30,676
Christian	14	2	0	12	32,141
Clark	26	2	0	24	41,317
Clay	35	3	0	32	102,395
Clinton	36	4	0	32	76,251
Coles	7	0	0	7	6,567
Crawford	10	2	2	6	14,845
Cumberland	4	0	0	4	7,647
DeWitt	1	0	0	1	2,003
Douglas	6	0	0	6	3,833
Edgar	13	0	0	13	10,368
Edwards	22	2	0	20	70,687
Effingham	13	0	0	13	36,901
Fayette	16	0	0	16	32,708
Franklin	8	0	0	8	23,556
Gallatin	12	3	0	9	32,929
Hamilton	30	4	0	26	101,763
Hancock	2	0	0	2	1,247
Jackson	2	0	0	2	2,182
Jasper	25	3	0	22	65,515
Jefferson	15	3	0	12	43,918
Johnson	1	0	0	1	1,010
Kankakee	1	0	0	1	89
Lawrence	31	4	0	27	68,384
Macon	1	0	0	1	2,101
Macoupin	5	0	0	5	2,755
Madison	16	1	0	15	18,614
Marion	19	4	0	15	42,535
McDonough	4	0	0	4	2,721
Menard	2	0	0	2	2,453
Monroe	2	0	0	2	1,650
Montgomery	23	0	0	23	35,033
Moultrie	2	0	0	2	5,601
Perry	14	1	0	13	25,158
Randolph	23	1	0	22	47,934
Richland	17	3	0	14	52,150
Saline	10	2	1	7	25,206
Sangamon	2	0	0	2	2,240
Shelby	11	1	0	10	23,028
St. Clair	5	0	0	5	9,978
Wabash	20	6	0	14	51,340
Washington	28	3	0	25	62,766
Wayne	38	7	0	31	126,187
White	57	15	1	41	184,484
Whiteside	2	0	0	2	2,729
Will	1	0	0	1	365
Williamson	2	0	0	2	5,364
Total	656	76	4	576	1,544,209

ILLINOIS
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Bond	5	2	0	3	6,938
Christian	13	7	0	6	31,928
Clark	37	20	0	17	33,972
Clay	60	23	0	37	168,526
Clinton	45	20	0	25	78,656
Coles	4	0	0	4	5,744
Crawford	68	45	2	21	72,514
Cumberland	1	1	0	0	381
Edgar	7	1	0	6	3,996
Edwards	84	43	0	41	248,083
Effingham	14	3	0	11	35,872
Fayette	23	8	5	10	34,490
Franklin	11	5	0	6	36,659
Gallatin	56	29	0	27	145,239
Hamilton	96	48	0	48	310,110
Jasper	14	4	0	10	40,198
Jefferson	49	22	0	27	138,610
Lawrence	105	68	0	37	199,680
Macoupin	3	0	0	3	1,462
Madison	19	5	0	14	11,701
Marion	53	24	0	29	118,252
McDonough	1	0	0	1	494
Montgomery	13	5	0	8	9,469
Perry	19	8	1	10	22,156
Randolph	2	1	0	1	4,570
Richland	71	38	0	33	214,920
Saline	3	0	0	3	8,943
Shelby	2	0	0	2	4,034
Wabash	73	30	0	43	164,006
Washington	25	11	0	14	44,748
Wayne	269	149	0	120	865,755
White	248	129	6	113	705,774
Total	1,493	749	14	*730	3,767,680

*Includes seven service wells.

INDIANA
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Boone	1	0	0	1	1,202
Brown	1	0	0	1	675
Carroll	1	0	0	1	1,078
Clark	2	0	0	2	2,935
Crawford	4	0	0	4	4,973
Daviess	28	2	0	26	33,228
Dubois	7	0	0	7	9,494
Fountain	3	0	0	3	3,717
Gibson	77	16	1	60	163,937
Greene	9	0	1	8	11,545
Jasper	1	0	0	1	1,020
Knox	41	6	0	35	75,860
Kosciusko	1	0	0	1	3,295
Lawrence	3	0	0	3	4,143
Martin	1	0	0	1	700
Monroe	2	0	0	2	3,002
Montgomery	1	0	0	1	825
Orange	2	0	0	2	2,006
Parke	2	0	0	2	2,709
Perry	4	0	0	4	2,380
Pike	27	1	2	24	46,949
Posey	64	10	0	54	168,390
Putnam	2	0	0	2	3,018
Spencer	13	0	0	13	14,704
Sullivan	43	0	0	43	62,812
Tippecanoe	1	0	0	1	1,320
Vanderburgh	23	3	0	20	50,486
Vermillion	1	0	0	1	879
Vigo	37	1	0	36	65,417
Warnick	21	0	0	21	37,798
White	1	0	0	1	920
Total	424	39	4	381	781,617

INDIANA
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Allen	3	2	0	1	4,479
Boone	1	0	1	0	1,047
Daviess	20	0	0	20	19,308
Decatur	3	0	3	0	2,658
Delaware	1	0	0	1	1,220
Dubois	8	3	0	5	9,309
Gibson	184	81	0	103	354,990
Grant	1	1	0	0	1,040
Greene	1	0	0	1	1,739
Huntington	5	1	0	4	5,289
Jasper	2	0	0	2	284
Jay	7	5	1	1	7,738
Knox	150	61	0	89	240,087
Lawrence	1	1	0	0	1,740
Martin	2	0	0	2	2,156
Miami	5	3	0	2	4,567
Monroe	4	2	0	2	7,817
Perry	7	4	0	3	3,679
Pike	95	39	2	54	132,692
Posey	208	105	0	103	474,417
Rush	3	0	2	1	2,692
Shelby	3	0	3	0	2,646
Spencer	16	3	1	12	16,374
Sullivan	43	17	1	25	38,812

	Comp.	Oil	Gas	Dry	Footage
Vanderburgh	52	23	0	29	90,412
Vigo	22	17	0	5	36,918
Warrick	4	0	0	4	7,076
Wells	2	1	0	1	2,069
Total	853	369	14	470	1,473,255

MICHIGAN
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Allegan	63	9	0	54	92,491
Arenac	6	0	0	6	17,226
Barry	3	1	0	2	6,152
Bay	4	0	0	4	14,200
Cass	1	0	0	1	950
Charlevoix	1	0	0	1	1,861
Clare	11	3	1	7	38,125
Gladwin	1	0	0	1	4,552
Gratiot	4	0	0	4	13,049
Huron	1	0	0	1	1,420
Hillsdale	1	0	0	1	1,497
Ionia	2	0	0	2	5,730
Iosco	1	0	0	1	4,319
Isabella	6	1	0	5	21,045
Jackson	3	0	0	3	9,036
Kalamazoo	1	0	0	1	1,164
Kalkaska	2	0	0	2	6,402
Kent	9	1	0	8	21,440
Lake	5	0	5	5	12,011
Lapeer	2	0	0	2	4,115
Livingston	1	0	0	1	950
Mackinac	1	0	0	1	805
Macomb	1	0	0	1	2,941
Manistee	1	0	0	1	4,861
Mason	2	1	0	1	11,381
Mecosta	7	0	1	6	20,399
Midland	2	0	0	2	5,328
Missaukee	1	0	0	1	3,960
Monroe	1	0	0	1	2,621
Montcalm	18	0	0	18	57,663
Muskegon	8	2	0	6	19,091
Newaygo	11	0	1	10	27,377
Oceana	17	1	0	16	41,679
Ogemaw	2	2	0	0	8,533
Osceola	5	0	1	4	17,233
Oscoda	1	0	0	1	4,334
Otsego	5	1	0	4	27,166
Ottawa	18	0	0	18	31,288
Roscommon	1	0	0	1	4,981
St Clair	6	0	1	5	14,058
Saginaw	4	0	0	4	10,538
Sanilac	1	0	0	1	985
Tuscola	5	0	0	5	12,038
Van Buren	29	2	0	27	33,381
Wayne	1	0	0	1	1,295
Wexford	1	1	0	0	3,958
Total	277	25	5	247	641,659

OHIO
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Coshocton	3	1	0	2	10,260
Hocking	1	0	1	0	3,104
Knox	2	1	0	1	5,575
Lorain	1	0	0	1	2,547
Mahoning	1	0	0	1	3,534
Medina	3	0	1	2	9,997
Meigs	2	0	1	1	8,184
Morgan	1	0	0	1	5,153
Perry	1	0	0	1	3,440
Portage	3	0	1	2	12,833
Richland	1	0	1	0	2,561
Stark	1	0	1	0	4,278
Summit	6	0	0	6	22,936
Vinton	1	0	0	1	3,137
Washington	12	0	2	10	53,849
Wayne	2	0	0	2	7,504
Total	41	2	8	31	158,892

WESTERN KENTUCKY
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Breckenridge	1	0	0	1	546
Christian	7	0	0	7	7,542
Daviess	45	2	2	41	73,458
Grayson	2	0	0	2	1,797
Hancock	7	0	0	7	6,909
Henderson	84	11	0	73	202,365
Hopkins	26	4	0	22	54,992
Logan	3	0	0	3	5,206
McLean	32	3	0	29	64,836
Muhlenberg	17	1	1	15	22,395
Ohio	20	0	0	20	19,516
Todd	4	2	0	2	3,898
Union	17	2	0	15	43,005
Wayne	1	0	0	1	1,938
Webster	34	6	0	28	88,300
Total	300	31	3	266	596,753

WESTERN KENTUCKY
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Butler	1	0	0	1	838
Crittenden	1	0	0	1	1,390
Daviess	128	63	9	56	171,628
Hancock	40	13	1	26	22,158
Henderson	188	101	0	87	427,514
Hopkins	16	5	0	11	42,818
McLean	68	36	0	32	126,634
Monroe	1	0	0	1	750
Muhlenberg	27	9	2	16	22,540
Ohio	124	43	0	81	99,421
Todd	6	2	0	4	8,915
Union	29	9	0	20	66,012
Webster	99	63	0	36	230,326
Total	728	344	12	372	1,220,944

ARIZONA
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Navajo	1	0	0	1	7,211
Coconino	1	0	0	1	3,544
Total	2	0	0	2	10,755

COLORADO
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Adams	4	3	0	1	27,702
Archuleta	2	0	0	2	1,241
Boulder	2	0	0	2	4,271
Jackson	2	1	0	1	13,968
LaPlata	12	1	9	2	60,292
Logan	143	109	3	31	736,640
Mesa	2	0	0	2	5,369
Moffat	6	2	4	0	82,207
Morgan	13	1	1	11	70,174
Rio Blanco	7	3	0	4	39,869
Washington	9	5	0	4	53,292
Weld	39	18	2	19	258,174
Total	241	143	19	79	1,302,190

COLORADO
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Adams	4	2	0	2	20,179
Alamosa	1	0	0	1	6,574
Arapahoe	1	0	0	1	7,699
Archuleta	2	0	0	2	3,226
Boulder	1	0	0	1	1,575
Delta	3	0	0	3	2,594
Garfield	1	0	1	0	6,815
Grand	1	0	0	1	4,705
Huerfano	1	0	0	1	4,630
Kiowa	5	0	1	4	28,039
Kit Carson	3	0	0	3	13,206
Jackson	1	0	0	1	6,180
LaPlata	3	0	1	2	17,031
Larimer	1	0	0	1	7,760
Lincoln	3	0	0	3	13,331
Logan	79	10	2	67	290,304
Moffatt	13	0	2	11	54,797
Mesa	2	0	1	1	3,472
Montrose	1	0	0	1	7,479
Morgan	28	2	0	26	108,848
Otero	1	0	0	1	6,183
Phillips	5	0	0	5	20,731
Prowers	1	0	0	1	5,990
Rio Blanco	4	0	0	4	19,049
Routt	1	0	0	1	2,458
Saguache	5	0	0	5	19,952
San Miguel	3	0	0	3	17,562
Sedgwick	3	0	1	2	11,205
Washington	34	4	1	29	178,653
Weld	31	1	0	30	213,535
Yuma	3	0	0	3	14,180
Total	245	19	10	216	1,277,872

IDAHO
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Bear Lake	1	0	0	1	6,768
Caribou	1	0	0	1	7,868
Total	2	0	0	2	14,636

MONTANA
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Big Horn	1	1	0	0	2,047
Blaine	34	23	3	8	110,010
Carbon	2	0	0	2	9,863
Chouteau	1	0	0	1	3,905
Dawson	12	9	0	3	104,445
Glacier	41	26	3	12	123,581
Liberty	15	3	2	10	39,105
McCone	1	1	0	0	7,278
Musselshell	1	0	0	1	5,669
Pondera	24	17	0	7	52,983
Roosevelt	13	11	0	2	76,809
Rosebud	6	2	0	4	30,028
Teton	26	12	1	13	57,840
Toole	62	44	3	15	101,861
Valley	6	0	6	0	4,856
Wibaux	2	2	0	0	18,070
Total	247	151	18	78	748,350

MONTANA
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Big Horn	6	1	0	5	20,145
Blaine	8	0	0	8	35,276
Carbon	6	0	0	6	25,547
Carter	1	0	0	1	8,710
Cascade	1	0	0	1	792
Chouteau	3	0	0	3	8,115
Custer	1	0	0	1	9,211
Dawson	12	3	0	9	112,820
Fallon	2	1	0	1	18,403
Fergus	6	0	0	6	13,170
Hill	8	0	0	8	33,310
Liberty	4	0	0	4	9,963
McCone	2	1	0	1	19,448
Musselshell	4	0	0	4	17,198
Park	3	0	0	3	8,139
Petroleum	1	0	0	1	2,280
Phillips	4	0	0	4	16,679
Pondera	3	0	0	3	5,552
Powder River	1	0	0	1	9,062
Prairie	1	0	0	1	10,762
Roosevelt	7	4	0	3	47,843
Rosebud	4	1	0	3	28,416
Stillwater	2	0	0	2	12,547
Teton	2	0	0	2	3,540
Toole	3	0	0	3	8,320
Valley	1	0	0	1	7,037
Wibaux	1	1	0	0	9,746
Yellowstone	1	0	0	1	6,454
Total	98	12	0	86	508,485

NEVADA
Wildcat Completion by Counties

	Comp.	Oil	Gas	Dry	Footage
White Pine	1	0	0	1	11,543
Total	1	0	0	1	11,543

NORTH DAKOTA
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
McKenzie	1	0	0	1	11,725
Williams	84	75	0	9	727,559
Mountrail	1	1	0	0	8,276
Total	86	76	0	10	747,560

NORTH DAKOTA
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Barnes	1	0	0	1	1,671
Bottineau	2	0	0	2	14,692
Burleigh	4	0	0	4	20,452
LaMoure	1	0	0	1	2,793
McHenry	2	0	0	2	14,429
MacIntosh	1	0	0	1	4,777

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	Comp.	Oil	Gas	Dry	Footage
McKenzie	3	2	0	1	32,813
McLean	1	0	0	1	8,900
Morton	2	0	0	2	2,900
Oliver	1	0	0	1	7,841
Ramsey	1	0	0	1	3,745
Stutsman	3	0	0	3	9,720
Towner	4	0	0	4	12,053
Ward	3	0	0	3	29,798
Williams	7	2	0	5	68,883
Total	36	4	0	32	254,463

NORTHERN NEW MEXICO
Development Completion by Counties

	Comp.	Oil	Gas	Dry	Footage
Rio Arriba	61	4	52	5	220,777
San Juan	262	1	247	14	988,661
Total	323	5	299	19	1,209,438

NORTHERN NEW MEXICO
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
McKinley	2	0	0	2	3,446
Rio Arriba	7	0	1	6	34,071
San Juan	14	1	1	12	65,055
San Miguel	1	0	0	1	4,395
Total	24	1	2	21	106,967

SOUTH DAKOTA
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Bennett	1	0	0	1	3,370
Bon Homme	1	0	0	1	900
Butte	1	0	0	1	3,250
Corson	1	0	0	1	9,010
Fall River	1	0	0	1	800
Faulk	1	0	0	1	2,749
Haakon	1	0	0	1	4,743
Hyde	1	0	0	1	2,715
Meade	1	0	0	1	1,280
Perkins	1	0	0	1	8,317
Shannon	1	0	0	1	3,975
Sully	1	0	0	1	2,618
Walworth	1	0	0	1	3,808
Total	13	0	0	13	47,535

UTAH
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Carbon	6	0	5	1	30,672
Duchesne	1	1	0	0	11,327
Uintah	22	17	1	4	164,746
Total	29	18	6	5	206,745

UTAH
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Boxelder	1	0	0	1	5,918
Carbon	3	0	1	2	22,419
Duchesne	6	2	0	4	42,920
Emery	3	0	0	3	11,516
Garfield	4	0	0	4	33,511
Grand	3	0	0	3	8,696
Millard	3	0	0	3	22,205
San Juan	4	0	0	4	23,786
Summit	1	0	0	1	8,631
Uintah	18	1	0	17	96,761
Utah	2	0	0	2	9,453
Wasatch	2	0	0	2	12,615
Total	50	3	1	46	298,431

WYOMING
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Big Horn	47	34	1	12	155,048
Campbell	1	0	0	1	9,714
Carbon	1	0	0	1	8,603
Converse	111	92	0	19	714,682
Fremont	45	31	3	11	180,689
Hot Springs	53	48	0	5	221,406
Johnson	39	24	1	14	245,179
Laramie	4	2	0	2	36,258
Natrona	51	29	1	21	198,622
Niobrara	6	1	0	5	26,392
Park	38	32	1	5	185,836
Sheridan	7	5	0	2	32,796
Sublette	3	0	1	2	3,962
Sweetwater	4	1	2	1	25,614
Washakie	8	7	0	1	39,657
Weston	109	76	0	33	586,718
Total	527	382	0	135	2,671,119

WYOMING
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Albany	4	0	0	4	10,986
Big Horn	11	0	3	8	64,527
Campbell	1	0	0	1	10,938
Carbon	8	1	0	7	46,367
Converse	8	0	0	8	37,509
Crook	1	0	0	1	1,620
Fremont	24	4	0	20	93,465
Goshen	7	0	0	7	43,207
Hot Springs	6	1	0	5	19,151
Johnson	18	6	0	12	99,767
Laramie	4	1	0	3	26,010
Natrona	25	2	1	22	106,630
Niobrara	10	0	0	10	38,420
Park	11	3	1	7	53,295
Sheridan	3	1	0	2	19,732
Sublette	2	0	0	2	20,869
Sweetwater	8	1	1	6	59,415
Teton	1	0	0	1	2,320
Uinta	1	0	0	1	13,370
Washakie	13	1	0	12	48,588
Weston	7	0	0	7	34,797
Total	173	21	6	146	858,171

CALIFORNIA
Wildcat Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Alameda	2	0	1	1	12,492
Butte	3	0	0	3	11,572
Colusa	3	0	1	2	18,102
Contra Costa	3	0	0	3	15,982
Fresno	28	3	0	25	197,495
Glenn	2	0	0	2	8,022
Humboldt	3	0	1	2	15,370
Imperial	3	0	0	3	20,862
Kern	209	29	1	179	816,182
Kings	14	0	0	14	55,609
Los Angeles	81	18	0	63	500,878
Madera	5	0	0	5	15,039
Marin	1	0	0	1	7,286
Merced	2	0	0	2	6,793
Monterey	30	4	0	26	94,961
Napa	1	0	0	1	11,145
Orange	15	4	0	11	78,675
Riverside	1	0	0	1	979
Sacramento	8	0	1	7	40,752
San Benito	14	1	0	13	49,558
San Bernardino	4	0	0	4	8,449
San Joaquin	8	0	0	8	39,424
San Luis Obispo	39	2	0	37	138,894
San Mateo	3	0	0	3	18,418
Santa Barbara	42	7	0	35	228,611
Santa Cruz	4	0	0	4	15,664
Solano	4	0	1	3	29,611
Stanislaus	1	0	0	1	4,993
Sutter	15	0	1	14	54,830
Tehama	1	0	0	1	3,411
Tulare	9	0	0	9	24,549
Ventura	34	4	0	30	208,487
Yolo	5	0	1	4	18,993
Total	597	72	8	517	2,771,832

CALIFORNIA
Development Completions by Counties

	Comp.	Oil	Gas	Dry	Footage
Butte	2	0	2	0	6,834
Fresno	100	94	0	6	293,030
Glenn	1	0	1	0	3,000
Humboldt	1	0	1	0	5,302
Kern	678	626	10	42	2,208,747
Kings	1	1	0	0	8,390
Los Angeles	401	391	1	9	1,843,628
Madera	1	0	1	0	2,700
Monterey	175	174	1	0	394,014
Orange	182	171	0	11	925,279
Sacramento	13	0	12	1	57,567
San Benito	4	3	0	1	6,145
San Bernardino	1	1	0	0	2,480
San Luis Obispo	26	23	0	3	66,907
Santa Barbara	69	64	2	3	322,372
Solano	1	0	1	0	6,324
Tulare	1	0	1	0	2,550
Ventura	179	170	2	7	1,385,657
Total	1,836	1,718	35	83	7,540,926

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THESE EVENTS MADE THE

OIL HEADLINES OF 1952...

FOR the oil industry, 1952 opened with misgivings and uncertainties and closed with optimism and activity at record levels. In between were many problems, many successes, and continued progress in technology and expansion of facilities.

Here are the highlights of the year, culled from the Journal's pages to give a quick reminder of the more significant events and trends. This does not purport to be a detailed chronology or complete record. Elsewhere in this issue are the factual records including oil and gas discoveries, production, deep drilling, area trends, and pipe lines, refinery and natural gasoline construction and other activities and accomplishments.

Here, month by month, are the major events which at the time held the industry's attention.

JANUARY . . .

Spot shortages of L.P.G. plague the industry. Manufacturers and distributors rush plans to build more steel storage to take care of seasonal fluctuations in demand. Underground storage for L.P.G. also receiving more attention.

Operating committee of West Edmond Hunton Lime Unit is upheld by federal circuit court in its control of dual-completion operation when one producing formation is not part of the unit.

Imperial Oil, Ltd., to spend $24,000,000 expanding and modernizing refineries at Ioco, B. C., and Regina, Sask., Canada.

Mexico in 1952 plans to drill 400 wells, spend $20,000,000 for lube plant at Salamanca refinery, build four products lines from Salamanca refinery

Sinclair Pipe Line Co. starts construction of 675-mile, 24-in. crude-oil pipe line from Cushing, Okla., to East Chicago, Ind.

Dr. Daniel P. Barnard, IV, research coordinator of Standard Oil Co. (Ind.), elected president of Society of Automotive Engineers.

Cities Service Oil Co. starts operating first U. S. Orthflow catalytic cracking unit at Ponca City, Okla., refinery.

Texas Railroad Commission authorizes Sohio Petroleum Co. to make tests in Spraberry trend to determine if one well will drain 80 acres.

Socony-Vacuum Oil Co., Inc., and subsidiaries will build three of its new type Thermofor catalytic reforming units (T.C.R.) at Beaumont, Tex., Torrance, Calif., and Augusta, Kans., refineries to cost $27,000,000.

Petroleum Administration for Defense approves big expansion in exploration, production, and refining operations to provide a cushion for possible emergencies. The program for 18 months starting July 1, 1952, purposes the drilling of 80,000 wells in the United States and 10,128 abroad including 4,020 in Canada.

Burmah Oil and Shell companies to build 30,000-bbl. refinery at Bombay, India, costing $45,000,000. Standard-Vacuum Oil Co. to build 19,000-bbl. plant in same area.

Standard Oil Co. (Ind.) will build 316-mile, 12-in. product pipe line from its Sugar Creek, Mo., refinery to Dubuque, Iowa.

Mathieson Chemical Co. starts operating $17,000,000 petrochemical plant at Brandenburg, Ky. Plant operates with natural gas.

Pure Oil Co. announces plans to build 26,000-bbl. Orthoflow catalytic cracking unit at its Smiths Bluff, Tex., refinery and 17,000-bbl. unit of same type at its Toledo refinery.

Humble Oil & Refining Co. wildcat in southern Alabama near Florida Panhandle flows from Upper Cretaceous-Lower Tuscaloosa formation at depth of 5,944-49 ft. Initial production 300 bbl. daily of 30° gravity crude oil.

Charges that American oil companies operating abroad are engaged in monopolistic and cartel practices to squeeze smaller operators out of the market are filed with House and Senate small business committees by Elmer Patman, attorney for Superior Oil Co.

Robert L. Foree, Dallas independent producer, is appointed director of production of Petroleum Administration for Defense.

Survey shows 16 domestic plants are producing 1,125 tons of sulfur daily from natural and refinery gases, and output is scheduled to double within 2 years.

Defense Production Administration promises sufficient steel to drill 45,000 wells in the United States in 1952 and provide refinery expansion by 1,000,000 bbl. per day by the end of 1953. DPA allots domestic oil and gas industry 1,709,500 tons of steel for second quarter, an increase of 1,000 tons over first quarter. Foreign operations are allocated 45,000 tons and Canadian operators, 22,500 tons.

Standard Oil Co. of California test completes X-55 for deeper production in Elk Hills field of California. Production at 9,309-50 ft. in Carneros formation 1,000 ft. deeper than any other production in the field controlled by U. S. Navy.

Socony-Vacuum Exploration Co. and Western Prairie Exploration Co. obtain 24° crude oil in wildcat discovery in southwest Saskatchewan of Canada, 28 miles northwest of Swift Current and 350 miles west of the most easterly oil in the province.

First "packaged" T.C.C. unit starts operating at Artesia, N. M., refinery of New Mexico Asphalt & Refining

Co. Unit provides for feed preparation, catalytic cracking, fractionation, gas-recovery plant, and catalytic polymerization.

International Petroleum Exposition announces that an exposition will be held in Tulsa in May 1953, the first oil show in 5 years.

FEBRUARY . . .

Shortage of heating oil in northeastern United States is threatened because Office of Price Stabilization refused to increase ceilings to compensate for increases in tanker rates. Twelve major and two independent companies agree to supply fuel oil at a loss of possibly $7,000,000 pending further study by OPS.

Suntide Oil Co. (Sunray et al) awards contract covering construction of new 28,000-bbl. refinery near Corpus Christi, Tex., to cost approximately $25,000,000.

Continental Oil Co. and Sinclair Oil Corp. to build a 310-mile, 8-in. products line from Sinclair, Wyo., to Salt Lake City, to be operated under the name of Pioneer Pipe Line Co.

Coastal Products Pipe Line Co., proposes to build a 260-mile, 20-in. products pipe line connecting refineries located in the Houston Channel area to Baton Rouge.

Morgan J. Davis, vice president of Humble Oil & Refining Co. in charge of exploration, elected president of American Association of Petroleum Geologists.

Gulf Oil Corp. starts construction of first pipe lines to transport ethylene from its Port Arthur, Tex., refinery to chemical companies located at Orange, Houston, and Texas City, Tex.

Union Oil Co. dedicates $8,000,000 research and development laboratory at Brea, Calif.

Creole Petroleum Corp. to build second 145-mile, 26-in. crude-oil pipe line from east side of Lake Maracaibo to Amuay Bay in Venezuela.

First major imports of natural gas from Alberta move across the international boundary to Montana defense plants.

Strataflow process, new method of locating levels of water entry in pumping wells, is revealed. Method involves displacing fluid in suspected area of well bore with fresh water and electrically recording changes in resistivity caused by incoming salt water.

International Bank for Reconstruction and Development begins second effort to find an acceptable settlement of the Iranian oil nationalization dispute.

West Texas Gulf Pipe Line Co. lets contracts for construction of 170 more miles of its 471-mile crude trunk line from Colorado City to Sour Lake, Tex.

M. L. Haider, deputy coordinator of producing activities for Standard Oil Co. (N.J.) becomes president of American Institute of Mining and Metallurgical Engineers.

Esso Standard Oil Co. adds $16,000,000 to its previously announced $35,000,000 expansion program at the Baton Rouge refinery.

Eastern States Petroleum Co. unveils world's first Udex aromatics-extraction unit at its Houston refinery. The new unit will extract 500 bbl. of aromatics from daily charge of 1,000 bbl. of platformate.

Buffalo Oil Co. reports well in old Maljamar pool, New Mexico, flowing about 500 bbl. a day from Devonian at 13,557 ft. Deepest well in Permian basin.

Producers of Pennsylvania Grade crude oil petition Office of Price Stabilization for increase of at least 72 cents per barrel in ceiling prices, claiming present $4.25 per barrel causes hardship.

Group of gas-pipe-line companies files suits challenging the constitutionality of the new Texas gas gathering tax.

Federal Power Commission asks Congress for more power in controlling operations of natural-gas companies. Major revisions sought in Natural Gas Act would give FPC jurisdiction over security issues, authority to require interconnection of facilities, power to regulate rates and service on imports and exports of gas, more leeway in investigations, and authority to allocate gas during periods of shortage.

Atlantic Refining Co. awards contracts for major expansion and modernization of its 117,000-bbl. Philadelphia refinery. Program includes biggest Orthoflow catalytic cracking unit yet contracted, and new ammonia plant.

Texas Pipe Line Co. announces plan for a big-inch products carrier to be built late this year from Port Arthur, Tex., to Baton Rouge.

Sterling Pipe Line System, a joint venture of Shell Pipe Line Corp., Texas Pipe Line Co. and Toronto Pipe Line Co., is approved by PAD. New system to be built and operated by Toronto, will carry crude from the Sterling, Colo., area to a connection with the Platte trunk line at Gurley, Neb.

Atlantic Refining Co. opens new research laboratory, first of its kind in the petroleum industry, to study product reactions under extreme high pressures.

National Petroleum Council receives report of its committee on oil and gas availability predicting that the world will find more oil during the next half century than during the past 50 years, and making specific forecasts on availability through 1955.

Standard-Vacuum Oil Co. ups its plans for expansion of Melbourne, Australia, refinery. Firm now contemplates plant with capacity of 22,000 bbl. daily. Present capacity is 1,800 bbl.

Salt Lake Pipe Line Co. completes new pump stations at Baker, Ore., and Juniper, Idaho, increasing capacity of its 8-in. products line from Salt Lake City to Pasco, Wash., by 5,000 bbl. to 22,000 bbl. daily.

MARCH . . .

Detailed study of petroleum transportation, issued by Petroleum Administration for Defense, lists probable requirements for transportation and storage facilities through 1955.

Southern Natural Gas Co. announces $76,000,000, 3-year construction program involving laying of 1,255 miles of gas pipe lines in Alabama, Florida, Georgia, Mississippi, and Louisiana.

Customs Bureau sets quota of crude, topped crude, and fuel oil which may be imported in 1952 at the reduced tax rate of 10½ cents per barrel at 4,977,848,000 gal., up about 579,000,000 gal. from 1951.

Cities Service catalytic cracking unit at firm's Lake Charles, La., refinery breaks world record with run of 1,058 days, just shy of the 3-year mark by 37 days. Unit processed 41,784,348 bbl. of feed.

Independent Petroleum Association of America petitions the Office of Price Stabilization to remove all price ceilings on crude oil and natural gas.

Anglo-Iranian Oil Co., Ltd., announces new process, called "Autofining," for removing sulfur from petroleum products. First unit being com-

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pleted at Llandarcy refinery in South Wales.

Brooklyn Union Gas Co. begins work on converting its huge system to straight natural gas. The conversion, a $21,000,000 project, is the largest of its kind ever undertaken.

Union Producing Co. completes wildcat gas strike in Monroe County, Mississippi, 100 miles northeast of nearest oil production in Madison, Yazoo, and Jasper counties. Open-flow potential is 35,000,000 cu. ft. of gas daily from Hartselle sand at 5,186-5,274 ft.

The three major operators in Venezuela—Creole Petroleum Corp., Mene Grande Oil Co., and Royal Dutch-Shell—announce planned expenditures of about $270,000,000 this year.

The Western Australian government and Anglo-Iranian Oil Co., Ltd., sign agreement for construction of new 80,000-bbl. refinery near Freemantle.

World Bank drops efforts to mediate the Iranian oil dispute after 3 months of failure.

K. C. Heald, vice president of Gulf Oil Corp., receives Sidney Powers Memorial Medal for 1952 from the American Association of Petroleum Geologists.

Salt Lake Pipe Line Co. will build a 330-mile, 8-in. products pipe line from Salt Lake City to Boise, Idaho, paralleling the existing line completed to Boise 2 years ago and extended to Pasco, Wash.

First significant deep production in the Delaware basin of West Texas and New Mexico is brought in by M. A. Grisham. The gas discovery well, on the western flank of the basin, blew in from Devonian at about 9,000 ft.

Union Oil Co. asks OPS for increase of 60 cents per barrel in price of California crude oil to increase production needed to meet growing demand on the West Coast.

First significant discovery of light oil in Saskatchewan by Canada Southern Oils, Ltd. The well, about 25 miles east of the Alberta boundary and 5 miles west of Coleville heavy-crude field, flowed 33°-gravity crude on a drillstem test.

C. H. Murphy gives Williston basin in United States its sixth discovery. The discovery well, located at East Poplar, Roosevelt County, Montana, flowed oil from the Mission Canyon and Charles sections of the Mississippi lime.

A fourth oil company, Atlantic Refining Co., begins production of anhydrous ammonia from petroleum raw materials, emphasizing the swing to petrochemicals for fertilizer materials.

Algonquin Gas Transmission Co. awards contract for construction of 140 miles of 26 and 24-in. natural-gas line from New Jersey to the Connecticut River between New Haven and Hartford, Conn.

Gulf Interstate Gas Co., newly formed by a group of Panhandle Eastern Pipe Line Co. and Trunkline Gas Co. officials, announces plans to build a 1,000-mile, 30-in. natural-gas line from the Gulf Coast to northeastern Kentucky. The line, if realized, will be the first big trunk to pipe gas entirely on a fee basis without owning the gas.

Lone Star Producing Co. will begin construction immediately of a natural-gasoline plant in West Texas' Fort Chadbourne field, closed in since February 1, by Texas Railroad Commission gas-conservation order. The $3,000,000 project will also include facilities for repressuring.

APRIL . . .

President Truman vetoes bill returning ownership of tidelands oil to the states.

Shell Refining & Marketing Co. places new 20,000-bbl. catalytic cracking unit on stream at Stanlow refinery in Cheshire, England. The project completes the final stage of Shell's postwar refinery-expansion program in the United Kingdom.

Operators in West Texas begin extensive test of drilling with natural gas instead of liquid as circulating medium.

Ohio Oil Co. completes its new 355-mile, 20 and 22-in. crude line from Wood River, Ill., to Lima, Ohio.

Two oil companies decline to participate in hearings by Wage Stabilization Board on unions' request for increased wages, showing determination of the companies to avoid industry-wide bargaining.

West Coast Pipe Line Co., plans construction of a 986-mile, 20 or 22-in. crude line from West Texas to California.

Richfield Oil Corp. completes its deep test in 29-year-old Wheeler Ridge field at southeast end of San Joaquin Valley, California, for 1,170 bbl. of 35°-gravity crude per day. The 9,757-ft. discovery well is flowing from 157 ft. of producing sand believed to be of Eocene age.

Alberta legislature approves the first important project to export natural gas from the province. Westcoast Transmission Co. makes plans for construction of pipe line from northern Alberta to the Pacific Northwest.

Sun Pipe Line Co. of Pennsylvania announces it will lay a 110-mile, 8-in. products carrier from Fostoria, Ohio (near Toledo), to Hudson (near Akron), to connect existing lines in northern Ohio.

Bureau of Mines publishes engineering study prepared by Ebasco Services, Inc., which indicates that synthetic fuels, competitive with petroleum products, can be manufactured from coal at a slight profit.

Texas Railroad Commission requires producers to file monthly reports on volumes of gas flared from all wells, as another step in its campaign to reduce gas flaring.

Construction of $10,000,000 Sun Oil Co. refinery at Sarnia, Ont., starts.

Price Stabilizer Ellis Arnall says there will be no decontrol of crude-oil prices or lifting of ceilings.

Standard-Vacuum begins construction of its new 15,600-bbl. refinery near Durban, South Africa.

Imperial Oil, Ltd., lets contract for the major portion of a $13,500,000 construction project at its Ioco, B. C., refinery. The expansion will raise refinery capacity from the current 12,000 bbl. to 22,500 bbl. daily. New facilities include a new 7,600-bbl. fluid cat cracker.

MAY . . .

Strike of oil workers closes down about one-third of the nation's refining capacity. Negotiations for settlement are conducted at local level at many struck installations.

Theodore W. Legatski, assistant director of research for Phillips Petroleum Co., receives Hanlon Award from the Natural Gasoline Association of America.

Union Oil Co. rates its deep Sespe zone strike in Torrey Canyon field of the Santa Clara Valley in California as a major discovery.

The world's largest crude-oil pipe line—owned by Iraq Petroleum Co., Ltd.—is completed from Kirkuk, Iraq,

to Lebanon, permitting additional crude to reach Europe to offset the Iranian shutdown.

First shipment of crude from Minas field in Central Sumatra leaves Far East. Field is regarded as one of the largest in that part of the world with reserves estimated at half a billion barrels.

Supreme Court of United States upholds the validity of the Oklahoma Compulsory Unitization Law.

Transcontinental Pipe Line Co. completes final section of its 1,840-mile system from Southwest's gas-producing areas to New York with the laying of 6,600-ft. of 24-in. pipe across the bottom of New York Harbor.

Operators in the Canyon Reef of Scurry County, Texas, announce plans for a unit-operation agreement, the largest such ever attempted.

J. Ed Warren, Texas independent producer, becomes deputy petroleum administrator, succeeding Bruce K. Brown, president of Pan-Am Southern Corp.

Five major oil companies join to sponsor 3-year, detailed study of Ellenburger formation and associated rocks in West Texas. Study is being made by the University of Texas Bureau of Economic Geology.

Magnolia Petroleum Co. sets new record for deep production in the Permian basin in Andrews County, Texas. Discovery was completed through perforations at 13,840-84 ft. in the Ellenburger for 555 bbl. of oil daily through ½-in. choke.

Royal Dutch-Shell will close down its 30,000-bbl. refinery at Oranjestad, Aruba, Netherlands West Indies, at the end of this year.

Buckeye Pipe Line Co. lets contract for laying the first section of its new $23,400,000 Eastern Products Division.

Wage Stabilization Board agrees to approve increases up to 15 cents an hour in oil-industry wages. Unions reluctantly accept the decision and closed refineries gradually go back on stream after a month's shutdown as new local contracts are negotiated.

JUNE . . .

First figures show that the nation lost about 50,000,000 bbl. of refined products during the strike.

Texas Eastern Transmission Corp. and Delhi Oil Corp. conclude two contract agreements involving more than $7,500,000 for development of natural-gas reserves in the updip Eocene Wilcox strata of the Gulf Coastal Plain.

Federal Power Commission directs Northern Natural Gas Co. to ignore the order of the Kansas Corporation Commission fixing a minimum price of 8 cents per M.c.f. for gas produced by Northern in Hugoton field of western Kansas, insofar as it applies to gas moved in interstate commerce.

First attempt to move crude out of Iran by Italian interests is blocked by the British with the impounding of the 640-ton tanker, Rose Mary, at Aden on the Persian Gulf.

The President's Materials Policy Commission estimates domestic petroleum consumption in 1975 to be about 5,000,000,000 bbl., more than twice 1950 consumption, and gas consumption to be about 2½ times the 6 trillion cubic feet in 1950.

Standard Oil Co. (Ind.) will build its planned Williston basin refinery at Mandan, N. D. The 15,000-bbl. plant would be designed for easy expansion of capacity to 30,000 bbl.

Phillips Petroleum Co. 1 Glenna, Pecos County, Texas, wildcat, has been completed in the Ellenburger with a potential in excess of 100,000,000 cu. ft. of gas daily. Three more wells already under way.

Arabian American Oil Co. and Saudi Arabian Government agree to revise terms of company's concession to provide primarily for a split of profits before payment of United States taxes and for the appointment of two Saudi Arabians to company's board of directors.

Tennessee Gas Transmission Co. gets green light from FPC to proceed with its $128,216,000 construction program which will increase company's capacity by 205,000,000 cu. ft. daily. Project involves laying of about 900 miles of big-inch lines, installing about 165,000 hp. in compressor units, and adding about 250 miles of miscellaneous lateral lines.

First commercial fluid catalytic cracking unit rounds out 10 years of operation. The 13,300-bbl. unit was placed on stream at Baton Rouge during the early part of the war by Esso Standard Oil Co. Capacity now has been expanded to 32,000 bbl. daily.

Proposal to export natural gas to eastern Canada is filed with Federal Power Commission by Tennessee Gas Transmission Co. which proposes to extend its line across international boundary at Niagara Falls and export 66,000,000 cu. ft. daily of gas from the Southwest.

Latest figures show Middle East crude production averaged above 2,000,000 bbl. in April for the first time since the Iranian nationalization. Gains have led world production to a new all-time record production of 12,343,000 bbl. daily.

JULY . . .

American Petroleum Institute estimates oil industry's capital expenditures in 1952 will run about 4 billion dollars—far above those in any other year in history and about 25 per cent ahead of 1951.

Federal Power Commission rules favorably on El Paso Natural Gas Co.'s $108,680,164 expansion program, which will increase company deliveries of gas to California by about 300,000,000 cu. ft. daily. El Paso will lay 170 miles of main-line loops and a total of 153,000 hp. in main-line and booster compressor stations.

The Oil and Gas Journal survey shows there are now 67 underground storage caverns for L.P.G. in use or under construction with a present capacity of almost 1,200,000 bbl. This is now being enlarged to 3,835,000 bbl.

Northern Natural Gas Co.'s $38,690,000 expansion of its natural-gas-transmission system is approved by Federal Power Commission.

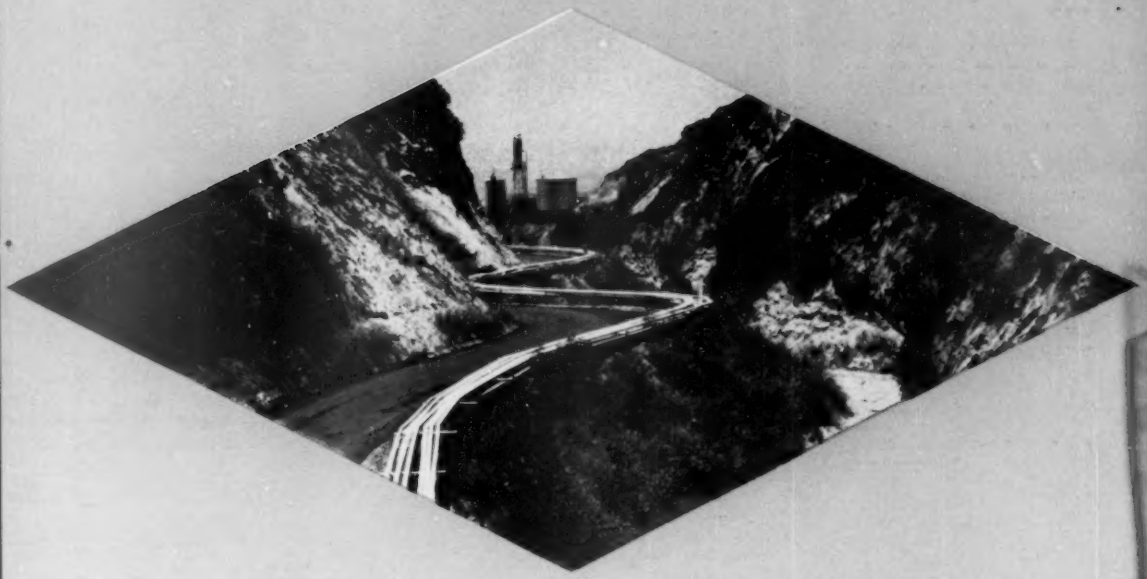
Long Beach Harbor Commission begins study of plan for water flooding portions of huge Wilmington field. If full-scale flooding is adopted, the project would rank second only to the East Texas operation in size.

Iran wins round over the British as World Court disclaims jurisdiction in the dispute over the Middle Eastern country's oil nationalization.

Atty. Gen. James P. McGranery to call a grand jury in the District of Columbia to investigate congressional charges that five American and two British oil companies are conspiring to control the international oil industry.

Atlantic Refining Co. requests Texas Railroad Commission permission to try a new type of water flood called the imbibition displacement method in Driver field in the Spraberry trend of West Texas.

The new 40,000-bbl. refinery at Antwerp, Belgium, owned by Compagnie



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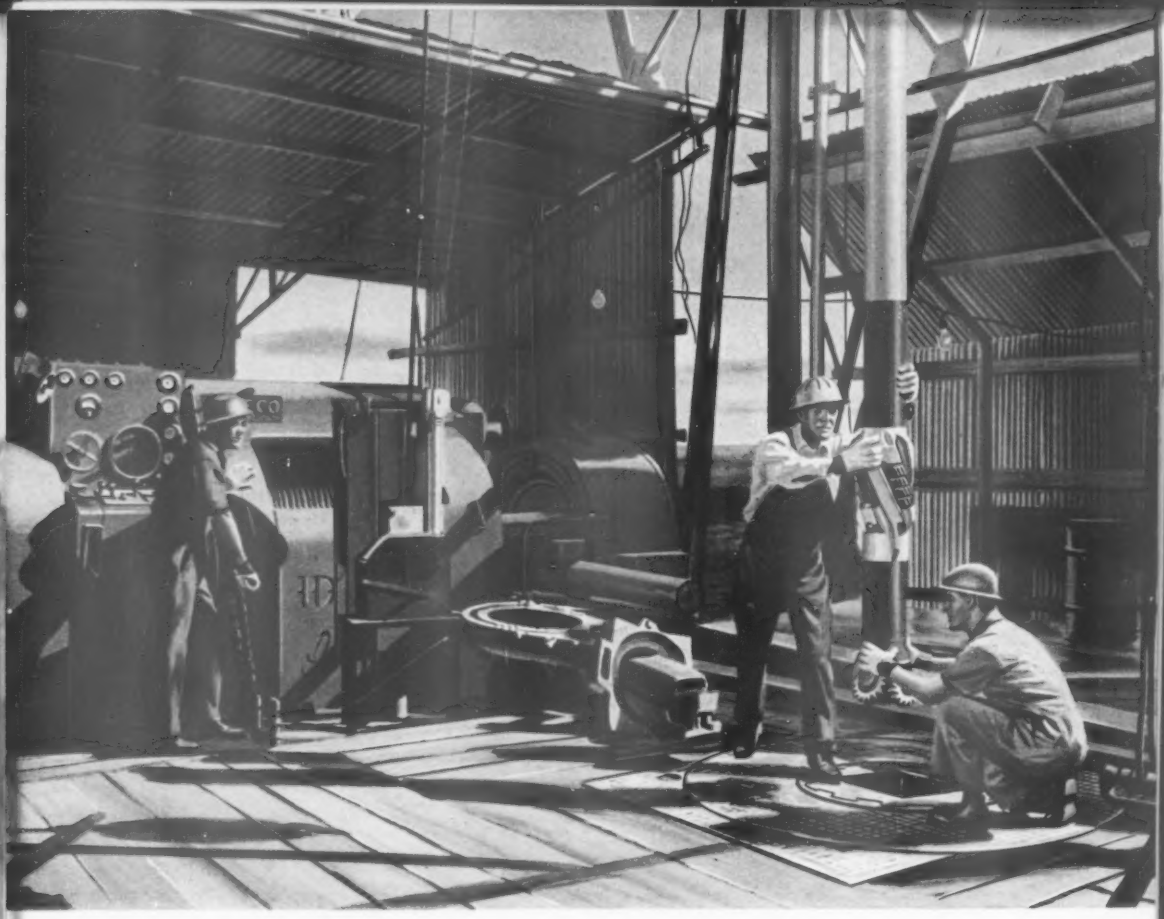

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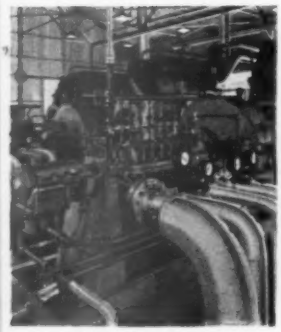
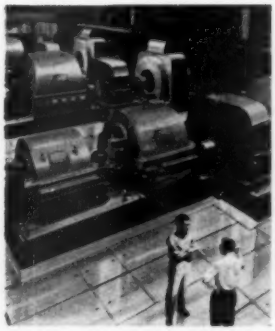
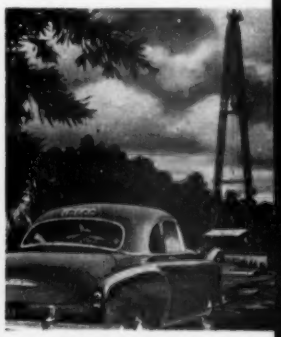


Pacific Pumps, Inc., *Huntington Park, Calif.* Centrifugal pumps, deep oilwell plunger pumps, hot oil and boiler feed pumps.



Roots-Connersville Blower Division, *Connersville, Ind.* Rotary positive blowers, gas pumps; centrifugal blowers, exhausters; positive displacement meters.

Security Engineering Division, *Whittier, Calif., Dallas, Tex.* Rock bits, reamers, casing scrapers, reamer rock bits, coring bits, Securaloy.



Ideco Division, *Dallas, Beaumont, Tex., Torrance, Calif.* Derricks, drawworks, rambler drilling rigs, traveling blocks, rotary tables.

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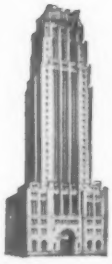


Financiere Belge des Petroles S. A. (Petrofina) and Anglo-Iranian Oil Co., is opened officially.

Judge Jack Roberts of the 126th District Court in Austin rules that Texas' hotly contested natural-gas-gathering tax is unconstitutional.

Texas Railroad Commission issues order requiring an accounting by producers of all gas produced in Texas and a statement of where the gas goes.

First commercial unit employing Atlantic Refining Co.'s new catalytic reforming process goes on stream at McBride Refining Co.'s La Blanca, Tex., refinery.

Creole Petroleum Corp. takes step toward establishing an independent pricing base for Venezuela crude oil by publishing prices at which it will sell and purchase Venezuelan crude oils, f.o.b. Venezuelan deep-water terminals.

Royal Dutch-Shell plans to expand the capacity of its Pernis, Netherlands, refinery to about 180,000 bbl. daily, thus making it the largest single processing installation in Western Europe.

Texas Gas Transmission Corp.'s $33,753,000 expansion program is approved by the Federal Power Commission. Expansion involves the laying of about 400 miles of 26-in. loop lines.

Texas Eastern Transmission Corp. places new 791-mile, 30-in. system in operation. Line starts near Kosciusko, Miss.

Richfield Oil Corp. announces $40,000,000 expansion of its Watson, Calif., refinery in California. Crude-oil capacity will be increased to 125,000 bbl. daily.

American Gas Association predicts that the natural-gas industry will set a new spending record in 1953. Expenditures will reach $1,571,000,000 for production, pipe lines, underground storage, and other construction.

AUGUST . . .

Union Oil Co.'s application of mass-flow principle to lifting granular solids, "Hyperflow," undergoing shakedown tests in the first commercial unit using the process.

Burmah Oil Co., Ltd., and the Burmese Government to organize a new company with assets of about $42,000,000 to restore and develop the war-destroyed oil industry in Burma.

Interstate Oil Pipe Line Co. to lay 137.6 miles of 22-in. pipe between Shreveport and Baton Rouge to permit daily movement of about 50,000 bbl. of northeastern Texas crude oil.

Sun Oil Co. announces multimillion-dollar water-flood project expected to recover an additional 90 million barrels of oil from Delhi field of Richland, Franklin, and Madison parishes of North Louisiana.

Stanolind Oil & Gas Co. gets the first oil recovered from the Mesaverde formation in the Green River basin in its Middle Mountain area wildcat in Wyoming's Sweet Water County.

Northern Natural Gas Co. acquires a controlling interest in Permian Basin Pipeline Co., the firm formed in 1950 to build a 384-mile, 26 and 30-in. gas line from the Permian basin area and eastern New Mexico to a connection with Northern at Skellytown, Tex.

Phillips Petroleum Co. buys Shell Pipe Line Corp.'s 394-mile crude-oil line between McCamey and Brookshire, Tex.

Cartel activities on the part of five American and two British and Dutch companies operating world wide is charged in long-surpressed Federal Trade Commission staff report made public by Senate small business committee. Department of Justice files civil suits in New York against four of the companies alleging overcharges on Middle East oil sold in Europe on Marshall-plan funds. All companies deny charges.

Construction of a 14-in. products pipe line by the new Wolverine Pipe Line Co. from Chicago to the Detroit and Toledo areas will be undertaken by Shell, Texas, and Cities Service interests.

Pacific Northwest Pipeline unveils plan before the Federal Power Commission to spend $40,000,000 during the next 8 years to secure reserves of natural gas in the San Juan and Uinta basins for a $130,000,000 gas line it would build to Washington and Oregon.

Standard Oil Co. of California will build a giant 54,000-bbl. vacuum-distillation unit and a 36,000-bbl. fluid catalytic cracking unit at its El Segundo refinery near Los Angeles.

Petroleos Mexicanos Tenixtepec 2 in the State of Veracruz, Mexico, is completed for what may be the most important oil discovery in Mexico in nearly a quarter-century.

Salt Lake Pipe Line Co. lets contract for new 330-mile, 8-in. products line from Salt Lake City to Boise, Idaho.

Anglo-Iranian Oil Co., Ltd., asks World Court to appoint an arbitrator in the Iranian oil-nationalization case.

Indonesian State Mining Commission votes to return to Royal Dutch-Shell its producing and refining properties in North Sumatra. Stiff oppoistion is expected, however, before all necessary approvals are obtained.

Construction of Trans Mountain crude trunk leads Shell of Canada to announce expansion of its 7,000-bbl. Shellburn refinery near Vancouver which will double capacity of the plant.

SEPTEMBER . . .

New reciprocal-trade agreement between United States and Venezuela is signed at Caracas. Provisions eliminate the quota system and establish new import-tax rates on crude petroleum and residual fuel oil of 5.25 cents per barrel on oil under 25° gravity and 10.5 cents per barrel on higher gravity.

Phillips Petroleum Co.'s 1 Glenna in Pecos County, Texas, establishes deep-production record in the Permian basin. Well is completed in the Ellenburger at 14,522 ft.

Petroleum Development (Qatar), Ltd., and the shaikh of Qatar reach agreement on 50-50 government-company participation in oil profits.

Office of Price Stabilization permits pipe fabricators to pass along increase in costs resulting from the price boost of $5.20 per ton granted steel producers. Prices of all varieties of tubular goods to advance.

Gulf Interstate Gas Co., formed by Panhandle Eastern Pipe Line Co., lays plans for 860-mile, $128,000,000 gas trunk before Federal Power Commission. The big line, first major project to carry gas entirely on a fee basis, would run from South Louisiana to West Virginia.

W. Alton Jones, president of Cities Service Co., following visit to Iran says he made no agreement or commitment of any kind with the Iranian Government, but says he discussed the purchase of Iranian oil as a "remote possibility."

Northern Natural Gas Co. files plans with Federal Power Commission for a $70,000,000 expansion program which would increase its capacity by about 300,000,000 cu. ft. daily. It would comprise about 442 miles of main lines and about 73,000 hp. in compressor stations. The new facilities would be used to transport gas delivered to

Northern by Permian Basin Pipe Line Co.

El Paso National Gas Co. launches campaign to secure official approval of 400,000,000-cu. ft. expansion of its system from West Texas and New Mexico fields to California. Program would cost $176,000,000.

Indiana Standard granted pipe allotments by PAD for new 243-mile, big-inch products line from Whiting, Ind., to River Rouge, Mich.

OCTOBER . . .

Cartel case opens in District of Columbia federal court. Companies are unsuccessful in attempt to dismiss grand jury subpoena for documents and to transfer case to New York. Companies take case to Supreme Court.

Creole Petroleum Corp. launches design work for $35,000,000 construction program to double capacity of its Amuay Bay refinery in Venezuela to 120,000 bbl. daily. Big unit in the program will be a 10,000-bbl. fluid hydroformer.

W. R. Grace & Co. enters petrochemical field with announcement that a new subsidiary, Grace Chemical Co., will build an $18,000,000 plant near Memphis to synthesize ammonia and other nitrogen products from natural gas.

Gulf Oil Corp. asks the Texas Railroad Commission to approve a unit-operating agreement for the biggest and most significant pressure-maintenance program ever planned in West Texas. Program would provide for water and gas injection into the San Andres reservoir overlying the south dome of the 557-well Goldsmith field in Ector County.

Iran breaks off diplomatic relations with Britain, squelching hopes that a settlement of the oil-nationalization issue might be reached soon.

Northeastern Gas Transmission Co. delivering natural gas to all of the authorized 35 New England utility companies on completion of its 515-mile system in Massachusetts, Connecticut, and New Hampshire.

Last signatures required for unitizing all of Kelly-Snyder and a part of Diamond M field in Scurry County, Texas, are obtained. This clears biggest hurdle to operation of the world's largest secondary-recovery project.

Richfield Oil Corp. and Long Beach Oil Development Co. agree to undertake pilot flood in three-well pool in Wilmington field.

Cities Service Oil Co. plans a multimillion-dollar expansion of its East Chicago, Ind., refinery. Major units will include a 30,000-bbl. crude-topping plant and a 12,000-bbl. catalytic reforming unit.

Bechtel Corp. releases study of the possibility of constructing a 2,500-mile overland natural-gas pipe line from the gas fields of the Middle East to Paris and Western Europe.

Sinclair Pipe Line Co. will start construction of a 90-mile, 12-in. products line from the company's refinery near Houston, to Port Arthur. At Port Arthur the line will connect with Evangeline Products System, a 195-mile, 16-in. line from Port Arthur to connect with the Plantation System at Baton Rouge.

Government and industry leaders from throughout Canada view official opening of Canadian Oil Refineries, Ltd., refinery near Sarnia, Ont., the dominion's most modern plant. The 20,000-bbl. plant is owned 99 per cent by Canadians and is processing Alberta crude for a local market.

Sinclair Pipe Line Co. gets certificates of necessity for construction of the Harbor line, a 110,000-bbl., 16-in. products carrier from Philadelphia to New York.

Southern Natural Gas Co. lets contracts for 833 miles of big-inch gas-transmission lines in Louisiana, Mississippi, Alabama, Georgia, and South Carolina.

Salt Lake Pipe Line Co. will begin work as soon as right-of-way clearance can be obtained and delivery of pipe assured on a 140-mile, 8-in. extension of its product line to Pasco, Wash., from Pasco to Spokane. The $4,500,000 line will have an initial capacity of 12,000 bbl. daily.

Standard Oil Co. of Texas completes $10,000,000 expansion program at its El Paso, Tex., refinery. Crude capacity is increased 7,000 bbl. to a new high of 25,000 bbl. daily. Program involved construction of an 11,500-bbl. Houdriflow cat cracker, a 7,555-bbl. vacuum-flash unit, a gas-discovery plant, and a 1,400-bbl. alkylation plant.

Continental Pipe Line Co. starts construction of 127-mile, 12-in. crude line from Wichita Falls, Tex., to Oklahoma City. At Oklahoma City the 53,000-bbl. line will connect with the company's 8-in. line from Oklahoma City to Ponca City, where Conoco's largest refinery is located.

NOVEMBER . . .

General Petroleum Corp. will build a 35,000-bbl. plant at Ferndale, Wash., 12 miles south of the Canadian border. Crude oil will be obtained from Trans Mountain Oil Pipe Line through an extension of the line from Vancouver, B. C.

Platte Pipe Line Co., Kansas City, welded the last section of its 1,100-mile, 20 and 16-in. trunk line from the Big Horn basin of Wyoming to Wood River, Ill.

Continental Pipe Line Co. plans construction of a 600-mile, 8-in. products line from Billings, Mont., to Spokane, Wash. The project, designated the Yellowstone Pipe Line, will have an initial capacity of 25,000 bbl. of products daily.

Thirteen companies compete in surprisingly heavy rush for best-looking Peruvian acreage with the opening period for concession applications under the country's new oil law. Applications cover about 9,800,000 acres—mostly in the Sechura Desert.

SEREPT, a French Government-backed company, strikes oil in Tunisia about 78 miles southwest of Tunis. Well reportedly found the pay at about 1,800 ft.

Southern Natural Gas Co. gets Federal Power Commission approval to lay out $32,518,500 for a new gas-supply system in Louisiana and Mississippi. Construction comprises 336 miles of lines and about 8,700 hp. in new compressor capacity.

Anglo-Iranian Oil Co., Ltd., begins initial work on construction of its new 100,000-bbl. refinery at Aden on the Red Sea. Completion of construction is expected in about 2 years.

Gulf Oil Corp. reveals formation of a new company, Goodrich-Gulf Chemicals, Inc., by itself and B. F. Goodrich Co. to build a multimillion-dollar petrochemical plant on a 701-acre site at Orange, Tex.

Celanese Corp. begins production at its new $17,000,000 petrochemical plant at Pampa, Tex. Plant initially is producing acetic acid and acetic anhydride.

Carbide & Carbon Chemicals Co. begins initial construction work on new $36,000,000 petrochemical plant adjacent to General Petroleum Corp.'s

WHO PIONEERED FULL-FLOW FILTRATION?

WINSLOW,
OF COURSE

WHO SAID IT WOULDN'T WORK?

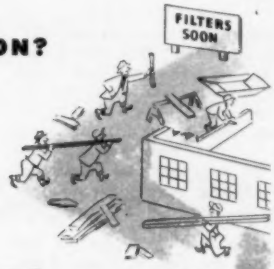
SEVERAL
COMPETITORS

WHO IS NOW FALLING INTO LINE?

THOSE SAME
COMPETITORS

WHO IS STILL THE NATURAL LEADER?

WINSLOW, OF COURSE



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125,000-bbl. refinery at Torrance, Calif. The plant will produce 50 to 60 million pounds of polyethylene and 5 to 10 million pounds of ethylene glycol annually from feed from the refinery.

United Gas Corp. becomes world's first company capable of handling a trillion cubic feet of natural gas per year. Company completes $129,000,000 expansion program in Texas, Louisiana, and Mississippi, boosting daily delivery capacity to about 4 billion cubic feet —a billion above its capacity before the construction.

New seismic shooting technique, involving exploding a mortar-ejected bomb at preset heights aboveground, is proved by tests to be more rapid and less expensive than conventional shothole surveys.

Accused companies in alleged international "oil cartel" case win partial victory in federal District Court. Judge Kirkland, who previously had cut the period for which records had to be submitted from January 1, 1928, to January 1, 1941, curbs the type and number of documents the companies are to produce for the grand jury investigation.

Showdown hearing begins on the authority of the Federal Power Commission to control production of natural gas as the commission summons Northern Natural Gas Co. before it on a charge of violating its orders not to transfer company reserves. Northern formed a subsidiary, Northern Production Co., and transferred its production and leases to the new firm, contending FPC has no jurisdiction over production and gathering.

Plantation Pipe Line Co. gets approval of PAD and DPA for $7,900,000 program to increase capacity of its products system from Baton Rouge to Greensboro, N. C.

DECEMBER . . .

Canada's Interprovincial Pipe Line Co. reveals it will extend its crude-oil pipe-line system about 635 miles from Superior, Wis., to Sarnia, Ont. The new 30-in. line and one pump station will be completed by the end of 1953. The company's existing system will be expanded to meet ultimate 300,000-bbl. daily capacity of the extension.

Alberta's Social Credit League, the party in control of the provincial government, reverses its previous stand and passes resolution calling for the export of surplus natural gas from Alberta and for expediting the production and distribution of the products from Pincher Creek field.

Petroleum Administration for Defense recommends across-the-board increase in ceiling prices on California crude oil and refined products after study of West Coast situation requested by OPS.

Ain Zalah field in northern Iraq is brought into commercial production by Iraq Petroleum Co., Ltd. Opening of the field was made possible by the completion of a new 134-mile, 12-in. line from the field to a connection with the main system at Station K-2.

Turkey acknowledges failure of its program for government development of its oil resources and reveals plans to open them to American and other foreign development. First step under new policy is taken, with the initiation of bids for construction of a refinery at Batman.

Standard Oil Co. of California places largest Platformer on stream at its El Segundo refinery. The 12,000-bbl. unit will be operated alternately producing high-octane motor fuel and aromatic concentrate.

Buckeye Pipe Line Co. completes first and largest of two sections of its new $24,000,000 Eastern Products Pipe-Line System. Completed 16-in. leg runs from Linden, N. J., to Allentown, Pa.

Grand jury investigation of the alleged international oil cartel is deferred another 2 months, from January 12 to March 16, to give the incoming Republican administration time to decide its policy with respect to the case.

Bahlein Petroleum Co., Ltd., a member of the Caltex group, formally notifies government authorities of Bahrein that it accepts the new 50-50 profit-sharing agreement. The new tax was embodied in a decree law effective retroactively to January 1, 1952.

Anderson-Prichard Oil Corp. buys controlling interest in Kanotex Refining Co., Arkansas City, Kans., acquiring through the deal Kanotex' 13,000-bbl. refinery at Arkansas City.

American Gas Association predicts that the natural-gas industry will spend about $1,570,000,000 for new construction in 1953—up about 50 per cent over 1952.

Texas Eastern Transmission Corp. and Wilcox Trend Gathering System are authorized by the Federal Power Commission to carry out a $34,000,000 natural-gas pipe-line construction program in Texas and Louisiana. The entire program will involve laying about 530 miles of lines ranging up to 24-in.

Texas Railroad Commission officially orders 80-acre spacing for what it designates the Spraberry Trend Area field. Commissioner Olin Culberson dissents, saying that the order is based on economic considerations, not waste-prevention reasons.

SARPOM, an Italian company owned 50-50 by the Caltex group and the manufacturing firm, Fiat, begins operation of a 13,300-bbl. per day refinery in northern Italy about 20 miles west of Milan. The plant will run on Middle East crude brought to the site by a 97-mile, 8-in. pipe line from a tanker terminal at Savona, 28 miles west of Genoa.

New selective acidizing method reported ready for initial application in three wells in southern Alberta. Method involves use of telescoping tubes extending from a cemented specially designed liner to the face of the formation.

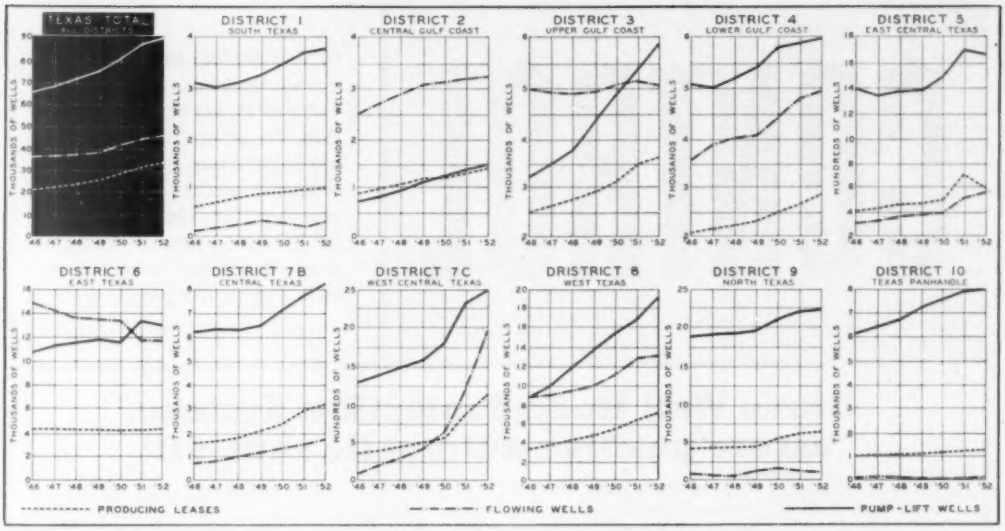
Platte Pipe Line Co. begins full operation of its big crude trunk line from Worland, Wyo., to Wood River, Ill. First oil reached Wood River November 23.

U. S. State Department says it will not interfere if American importers try to buy Iranian oil, but warns that the companies must take the risk of legal difficulties with the British.

Salt Lake Pipe Line Co. completes its new products line from Salt Lake City to Boise, Idaho. The 320-mile, $8,000,000 line parallels another 8-in. line laid earlier to Boise and on to Pasco, Wash.

National Security Resources Board submits composite report to President Truman of the views of the federal departments and agencies on the recommendations of the President's Materials Policy (Paley) Commission to meet the materials requirements of the nation 25 years hence. The report reflects the views of 22 agencies on the Paley Commission's 78 formal recommendations, among them those on synthetic-liquid fuels, exploration, shale oil, depletion, etc.

Petroleum Administration for Defense predicts potential peak-day demand for natural gas may increase 50 per cent to 38 billion cubic feet in the winter of 1955-56. Production, the agency estimates, will run slightly less than 3 billion cubic feet short of meeting this demand.


TEXAS TOTAL ALL DISTRICTS
DISTRICT 1 SOUTH TEXAS
DISTRICT 2 CENTRAL GULF COAST
DISTRICT 3 UPPER GULF COAST
DISTRICT 4 LOWER GULF COAST
DISTRICT 5 EAST CENTRAL TEXAS
DISTRICT 6 EAST TEXAS
DISTRICT 7B CENTRAL TEXAS
DISTRICT 7C WEST CENTRAL TEXAS
DRISTRICT 8 WEST TEXAS
DISTRICT 9 NORTH TEXAS
DISTRICT 10 TEXAS PANHANDLE
THOUSANDS OF WELLS
HUNDREDS OF WELLS
'46 '47 '48 '49 '50 '51 '52
PRODUCING LEASES
FLOWING WELLS
PUMP-LIFT WELLS

NO SUBSTANTIAL CHANGE

24,119 Artificial-Lift Wells Seen for '53

by Joseph A. Kornfeld

FOR the year 1953 The Oil and Gas Journal estimates that 24,119 wells will be placed on artificial lift. This represents substantially the same situation as last year.

Texas . . . Some 38 per cent of these units will be installed in Texas which leads the country with 9,118 wells to be placed on artificial-lift and pumping-well schedules. West Texas and North Texas will claim the bulk of these new units. But the types of wells vary greatly. Spraberry-trend completions go on the pump very quickly, for example. "Natural" flow wells in the same territory, however, may be characterized by the long flowing life of the deep Ellenburger and Devonian reservoirs in the Midland basin.

The chart on this page presents the 7-year trend as to number of producing leases, number of flowing wells, and a number of pump-lift wells for Texas as a whole and by individual Railroad Commission districts.

Mid-Continent . . . Second state in the artificial-lift category is Oklahoma. For there in 1953 it is estimated that 3,304 installations will be made. Kansas will have 2,215 installations. In both of these states extension drilling and stripper-type drilling development are common activities, and pumping is required for many of the completions.

Secondary recovery . . . As a matter of fact, increased popularity of waterflooding operations and gas injection projects account numerically for many pumping unit installations. Although many types of "pattern" layouts are possible, the standard five-spot pattern is most common. In a layout of any five-spot project covering a considerable amount of acreage, eventually the classification will be approximately one pumping oil well to be drilled, completed, and equipped for every water-injection well. Therefore, the number of pumping units required in secondary-recovery operations total up to a substantial magnitude.

Continuation of the present activity in secondary-recovery methods for increasing ultimate recoveries and oil-production rates is evident in the other older producing areas, principally in the Illinois basin and Appalachian fields. In Illinois, 1,103 artificial-lift units will be installed. Indiana will have 493 new units and Kentucky 528 new pumping wells. Michigan will gain 290 new lift wells.

Rocky Mountain area . . . Greatest concentration of new lift installations in the Rocky Mountain province will be in Wyoming with 461 wells to be placed on lift. Montana's older fields will require 230 new pump units in 1953.

ARTIFICIAL-LIFT SURVEY, 1953

	—Estimates for '53—	
	To be drilled	Artificial lift
Arkansas	422	228
California	2,456	1,964
Colorado	481	204
Illinois	2,162	1,103
Indiana	1,233	493
Kansas	4,615	2,215
Kentucky	1,319	528
Louisiana	2,599	1,326
Michigan	725	290
Mississippi	328	203
Montana	443	230
Nebraska	304	106
New Mexico	1,113	367
New York	733	367
Ohio	1,103	386
Oklahoma	5,797	3,304
Pennsylvania	1,946	973
Texas	16,579	9,118
West Virginia	558	111
Wyoming	768	461
Others	546	142
Total U. S.	46,230	24,119

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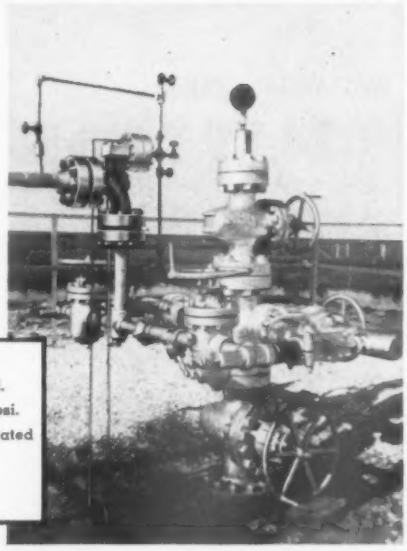

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(1) Bellena-Fontevio, (2) Caviaga, (3) Ripalta, (4) Cortemaggiore, (5) Val. Parola, (6) Centopozzi-Tabiano-Miano, (7) Podenzano-S. Giorgio, (8) Valleza, (9) Vizzola, (10) Gratera-Montechino - Velleja, (11) Pietramala, (12) Bando, (13) Consandola, (14) Polesine Group, (15) Montalbano, (16) Pellizzana, (17) Rosaima, (18) Ca Capello, (19) Ca Vendianin, (20) Gallare, (21) S. Alberto, (22) Tocco-Casauria, (23) Giotto, (24) Ripi, (25) S. Giovanni-Incarico, (26) Tramulola.
LEGEND
WILDCAT
PRODUCING GAS FIELD
PRODUCING OIL FIELD
GEOGRAPHIC REGIONS
1 PO BASIN
2 COASTAL PLAIN
2A TYRRHENIAN COASTAL PLAIN
2B ADRIATIC COASTAL PLAIN
2B-1 PO DELTA
2B-2 PESCARA BASIN
2B-3 FOSSA
2C MEDITERRANEAN
2C-1 RAGUSA BASIN
Corsica
Sardinia
Africa
ROME
9°
13°
17°
46°
42°
38°

Fig. 1—Map showing areas in Italy considered as attractive in which to prospect for oil and gas.

Italy Has Four Favorable Areas for Oil and Gas Search

Nation not only has market for new production, but also a compelling incentive to find new production

by W. Farrin Hoover

TWO major regions of Italy are the sites of producing fields. These two major geographic divisions and their subdivisions offer attractive areas in which to prospect for oil and gas. These major geographic divisions are: (1) the Po basin, and (2) the Coastal Plain. This later unit may logically be subdivided into three subdivisions or provinces namely (a) the Tyrrhenian Coastal Plain province, (b) the Adriatic Coastal Plain province, and (c) the Mediterranean Coastal Plain province. (See map, Fig. 1).

Stratigraphy

Italy and Sicily represent an area that has been elevated by orogenic movement from the Tethyian geosyncline, a depositional trough with essentially the same depositional history as the Appalachian and Rocky Mountain geosynclines of the North American continent. Following the Variscan orogeny, the European equivalent of the Arbuckle and Wichita orogenies in Mid-Continent United States, the Tethyian geosyncline was the site of sedimentation throughout most of Mezozoic time. Alpine orogenic movements deformed the Tethyian geosyncline and that portion now occupied by Italy and Sicily in a series of intermittent orogenic and tectonic movements from the close of Cretaceous time to late Pliocene—early Pleistocene time. These Tertiary movements of the Tethyian geosyncline had the effect of restricting the deposition of Tertiary sediments in Italy and Sicily.

The accompanying stratigraphic column shows the age and character of the sedimentary rocks described from the Italian peninsula.

Producing strata . . . Seven stratigraphic zones are productive of oil and gas in the sedimentary basins of Italy. In some localities production is obtained from two and three zones in the same field.

Table 1 shows the stratigraphic distribution of the production for the various producing fields in Italy. A study of this table shows that in the Po basin seven individual ages of strata produce oil. Two of these zones, the upper Miocene and lower - middle Miocene, produce gas in commercial quantities. Three zones are productive in Fontevivio-Bellana field and two in Val Parola field. The remaining fields listed for the Po basin have but one productive zone.

In the Po Delta section of the Adriatic Coastal Plain province, strata of Quaternary age produces gas in many small gas fields.

The production in the Pescara basin section of the Adriatic Coastal Plain province is obtained from upper and middle Miocene beds in Tocco-Casauria field.

Two stratigraphic zones, the lower-middle Miocene and Paleocene, are productive of gas and oil in the Tyrrhenian Costal Plains province. One of these zones, the Paleocene, is also productive in the Mediterranean Coastal Plain province on the Island of Sicily.

Po Basin

The Po sedimentary basin with an area of approximately 6,900 sq. miles lies north of the Apennine Alps, east of the Maritime Alps, and south of the Berganio Alps. It is separated from the Adriatic Coastal Plain on the east by an arbitrary line drawn from Verona to Bologna. Sediments ranging from Cretaceous to Quaternary in age are present in this basin. (See stratigraphic column).

Approximately 6,500 ft. of Cretaceous and Tertiary sediments has been tested on the southwest flank of the Po basin along what is known as the Emilian trend. In the central portion of the basin the sedimentary column may reach a thickness in excess of 10,000 ft.

Structure . . . Most of the currently producing fields of the Po basin are located along a structural trend known as the Emilian belt. This zone of deformation appears to be a zone of late to post-Tertiary deformation essentially parallel to the southern axis of the Apennine Alps and tangential to the arcuate structure of the northern end of these mountains. This lineal deformation crossing the west portion of the Po basin is characterized by anticlinal and fault structures.

Accumulation . . . The accumulation of oil and gas in the Po basin is controlled by the presence of anticlinal folds and faults. These structural traps are supplemented by sedimentary traps especially in those cases where the reservoir beds are along unconformities. In most cases accumulation of oil and gas is due to the presence of a combination of structural and stratigraphic or sedimentry traps.

Producing fields . . . The location of the producing fields in the Po basin described briefly below are shown on the map.

The productive portion of the Po basin is for the present limited to the Emilian belt. The accumulation of gas and oil along the Miocene-Pliocene and the lower Middle Miocene-upper middle Miocene unconformities suggests that structures with lower structural relief than those currently producing in the Emilian belt in the deeper portion of the Po basin will be productive if the requisite sedimentary and stratigraphic conditions for the accumulation of oil and gas are present in the deeper portions of the basin.

Production of the producing fields of the Po basin, as in the case of the Italian oil fields in general, is characterized by small daily production and low ultimate recoveries per acre-foot. These characteristics impose an economic limit on the depth to which wells may profitably be drilled.

In 1950 approximately 78 crew-months of seismic work was completed in the Po basin by seismic crews for the A.G.I.P. In addition to the seismic work, three exploratory wells were drilled to test seismic prospects.

The Cornegliano Laudense test, a 4,625-ft. test located on a structure north of the Caviga field, encountered gas in the upper Miocene. The apparent success of this test suggests that either a new field is in prospect or that Caviga field has been extended a considerable distance to the north.

The A.G.I.P. 5,890-ft. test located west of Cortemaggiore field was completed as a dry hole but interpretation of the results of this test suggests that a separate structure with producing possibilities lies west of Cortemaggiore field. A second test is planned for this prospect.

At Soresina, A.G.I.P. drilled an exploratory well to test a seismic prospect southeast of Ripalta field, a 1949 discovery. By the end of 1950 this well encountered a showing of gas with salt water at a depth of 5,397 ft. The showing of gas in the Soresina prospect, and the established gas production in Ripalta field, seem to indicate that the

STRATIGRAPHIC COLUMN

CENOZOIC

Quarternary

Recent
- Flood plain deposits
- Swamp deposits
- Lagunal deposits

Pleistocene
- Glacial deposits
- Flood plain deposits
- Marls
- Lagunal deposits
- Marine sands and clays

Tertiary

Pliocene
- Alternating beds marine sands and shales (Po basin and Coastal Plains.) Intermontane basin deposits (Apennine and Alps Mountains).

Miocene
- Conglomerates and fossiliferous sands overlain by blue marls grading upward into lagunal deposits (Coastal Plain and Po basin).

APENNINE TECTONIC MOVEMENT

Oligocene
- Bioherms in northern Italy (Po basin and N. Adriatic Coastal Plain province) grading south and west through a chalky Globerigina facies into a sandy facies in the Tyrrhenian Coastal Plain province.

Eocene
- Calcareous shales and basalt breccias with interbedded marls at the top. In northern Italy, Flysch facies and littoral deposits with some interbedded volcanic tuffs.

Paleocene?

Argile scagliose
- Variegated dark-green clays with red streaks. Locally with apparent inclusions of broken sandstone and limestone fragments without stratigraphic arrangement. The argile scagliose transgresses the Cretaceous-Tertiary time boundary. Megafossils date part of these sediments as Upper Cretaceous. The problem of the argile scagliose and the conditions under which these sediments were deposited is similar in many respects to the problem of the Chaney shale in Mid-Continent United States.

POST CRETACEOUS—PRE-EOCENE OROGENY IN APENNINE MOUNTAINS

MESOZOIC

Cretaceous
- Sandy shales locally metamorphosed to slates in northern Italy grade southward through a coralline limestone facies to a siliceous limestone facies in southern Italy and Sicily.

Jurassic
- Sediments of Jurassic ages exposed in restricted areas. Intensely metamorphosed. Not considered as possible oil and gas-producing strata because of metamorphosed condition.

Triassic
- Limestones locally metamorphosed to marble.

PALEOZOIC

Permo-Carboniferous
- Conglomerates, sandstones, and red slates with characteristic fossil flora, grading southward from a coarse clastic facies to a marine limestone facies. These sediments were laid down in a hinterhand area, south of the Hercynian Alps.

VARISCAN OROGENY

Cambrian
- (Exposed at surface on the islands of Sardinia and Corsica).

Upper Cambrian
- Sandstones with limestone dentils.

Middle Cambrian
- Limestones and dolomites.

Lower Cambrian
- Schists.

deeper portions of the Po basin will eventually prove to be productive.

Adriatic Coastal Plain

The coastal lowland fronting the Adriatic Sea from sea level to an elevation of approximately 2,000 ft. is a favorable area in which to prospect for oil and gas. The potential producing strata of this region range from the argile scagliose (Paleocene?) in the foothills of the inner margin to Quaternary sediments that are currently producing gas in the Po Delta section. Strata of Miocene age are producing in the Pescara basin section. Strata of Paleocene and lower middle Miocene age that are productive in the Po basin are mapped in the Adriatic Coastal Plain province. These sediments should be as productive in this province as they are in the Po basin under structural conditions favorable to the accumulation of gas and oil.

Po Delta section . . . The Po Delta section of the Adriatic Coastal Plain province is essentially an eastward extension of the Po basin with a marked increase in the thickness of the Quaternary deposits. These sediments were apparently deposited under conditions of sedimentation favorable for the formation of stratigraphic-type traps in nearly horizontal strata. The producing fields of the Po Delta are in general characterized by small production from stratigraphic traps in nearly horizontal sediments. The producing areas of the various fields are more or less uniformly small. Statistical data on the production of the individual fields of this area are not available from 1948 to present but in 1950 the aggregate production of these fields amounted to 7,000,000,000 cu. ft. of gas. This gas was produced from marine Quaternary sediments from depths ranging from 300 to 1,500 ft.

The Po Delta section has an area of approximately 4,400 sq. miles. The total area of the small producing fields of the Po Delta section is less than 20 sq. miles. On this basis a relatively large part of the Po Delta, underlain by strata that are known to be productive in the Po basin and in the Po Delta, is to be considered as prospective oil-producing territory. Careful detailed subsurface and sedimentary studies based on a well-planned deep core-drill and seismic program should result in the finding of additional production in sedimentary traps and in structures of relatively low structural relief in the Po Delta section of the Adriatic Coastal Plain.

In 1950 the Societa Ventea Metano (S.V.E.M.) drilled a 2,952-ft. test at Aquileja near the east edge of the Po Delta section. This test was abandoned as dry without finding any showings of either gas or oil.

Pescara basin section . . . The Pescara basin section of the Adriatic Coastal Plain is essentially an embayment in which Miocene and Pliocene sediments were deposited. Thrust faulting from the direction of the Apennine Alps formed anticlinal folds that were overridden by the thrust sheet. Subsequent erosion of the overthrust sheet has formed geologic windows or fenestrae which indicate the presence of this type of geologic structure. The presence of fenestrae along the inner margin of the Pescara basin may be taken to indicate the presence of geologic structures favorable for the accumulation of gas and oil.

Production from upper and middle Miocene strata was established in 1935 with the discovery of Tocco-Casauria field by A.G.I.P.

Strata ranging in age from Cretaceous to Pliocene are present in the Pescara basin and are all potential reservoir beds. Asphalt impregnations have been reported in strata of Miocene and Pliocene age as well as in limestones of the lower Eocene and lower Cretaceous. The geologic map of Italy shows the presence of fenestrae along the inner margin of this basin.

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TABLE 1—STRATIGRAPHIC DISTRIBUTION OF PRODUCTION IN ITALY'S FIELDS

Producing Strata	Po Basin	Adriatic Coastal Plain	Tyrrhenian Coastal Plain	Mediterranean Coastal Plain
Quaternary	Fontivivio-Bellana—Oil	Small fields—Gas (Po Delta)	.....	.....
Pliocene	Fontivivio-Bellana—Oil	.....	.....	.....
Upper Miocene	Fontivivio-Bellana—Oil; Caviaga—Gas; Ripalta—Gas; Cortemaggiore—Gas and oil	Tocco-Casauria—Oil (Pescara Basin)	.....	.....
Middle Miocene	Valleza-Virzola—Oil; Pietramala—Gas and oil	Tocco-Casauria—Oil—(Pescara Basin)	.....	.....
Lower-Middle Miocene	Val Parola—Oil; Centopozzi-Tobiana-Miano—Oil; Podenzano-S. Giorigio—Gas and oil	.....	S. Giovanni—Gas; Ripi—Oil	.....
Paleocene	Cratera-Montachino-Velleja—Oil	.....	Tramutola—Oil	Giotto—Gas
Argile Scagliose	Val Parola—Oil; Pietramala—Gas and oil	.....	.....	.....

Production may be expected from this type of structure since Rose Hill field in Virginia, U.S.A., produces from strata below a thrust fault in a geologic fenestra.

In 1950 the Ente Nazionale Metano (E.N.M.) drilled a test well on the northeast flank of the Pescara basin on a Miocene surface anticline. This test, the Penna S. Giovanni, was abandoned as a dry hole at a depth of 3,286 ft.

A total of 14 crew-months seismic work was done in the Pescara basin in 1950.

Future production in this basin will probably result from continued detailed seismic work coupled with careful and detailed stratigraphic and sedimentary studies based on surface work as well as a well-planned program of slim-hole drilling for stratigraphic information.

Fossa Bradanica . . . Fossa Bradanica is a linear area in which strata ranging from Miocene to lower Eocene and Cretaceous are present. Occurrences of asphaltic oil and seepages have been noted along the flanks of this trench-like feature. No tests for oil have been drilled in this area although Ricerche Petroli Italia Meridionale did 6 crew-months seismic work in the southern end of Fossa Bradanica.

Mediterranean Coastal Plain

The Mediterranean Coastal Plain includes all the lowland area on the south side of the Island of Sicily. Miocene and Pliocene strata are mapped in a basin-like outline in the vicinity of Ragusa.

Ragusa basin . . . The sole sedimentary basin on the Island of Sicily is the Ragusa basin in which marine Miocene and Pliocene sediments are present. Locally these strata are overlapped along the inner margin of the basin by basalt lava flows of Quaternary and Recent age. Asphaltic oil seepages have been reported from marls of lower Miocene age. Showings of oil in vesicles in the basalt lavas overlying Miocene and Pliocene strata suggest that the oil present in the underlying marine strata has been distilled by the heat of the lava flows to accumulate in the vesicles in the overlying lava.

Surface mapping shows the presence of faulted and folded structures that deform marine Miocene and Pliocene strata. Where the Tertiary strata are buried beneath Quaternary and Recent sediments, seismic work will be able to determine presence of buried structure.

Gioitto field (23, Fig. 1), operated by A.G.I.P., produces gas from the Paleocene on the northeast flank of the Ragusa basin. No data are available on the volume of gas produced from this field.

Two wildcat tests were drilled in 1950 by the Ente Sviluppo Valorizzazione Agricola Industriala Sicilia Orientai (E.S.V.A.I.S.O.) One of these, located near Catania, was to test the Pleistocene strata below Recent volcanic rocks. This test, bottomed at a depth of 1,935 ft., had showings of methane associated with salt water.

A second test was located near the west margin of the Catanian plain near

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the outcrop of lower middle Miocene. This well, drilled to a total depth of 1,476 ft., found small methane production in strata of Paleocene age.

The lowland and foothills region fronting the Tyrrhenian Sea on the west coast of the Italian peninsula from sea level to about 2,000 ft. elevation is underlain by sedimentary rocks ranging from Cretaceous to Pliocene in age. There is a marked absence of well-defined sedimentary and structural basins on this side of the Italian peninsula. The position of this region relative to the source of the stresses responsible for the deformation of the Italian peninsula suggests that the Tyrrhenian Coastal Plain province is a third-rate area in which to prospect for oil. Seepages and shows in Miocene and Pliocene strata are reported from several widely scattered localities, and the location of Ripi, S. Giovanni-Incarico and Tramulola fields (see 24, 25, and 26, Fig. 1) indicates that in favorable localities small quantities of commercial gas and oil are present.

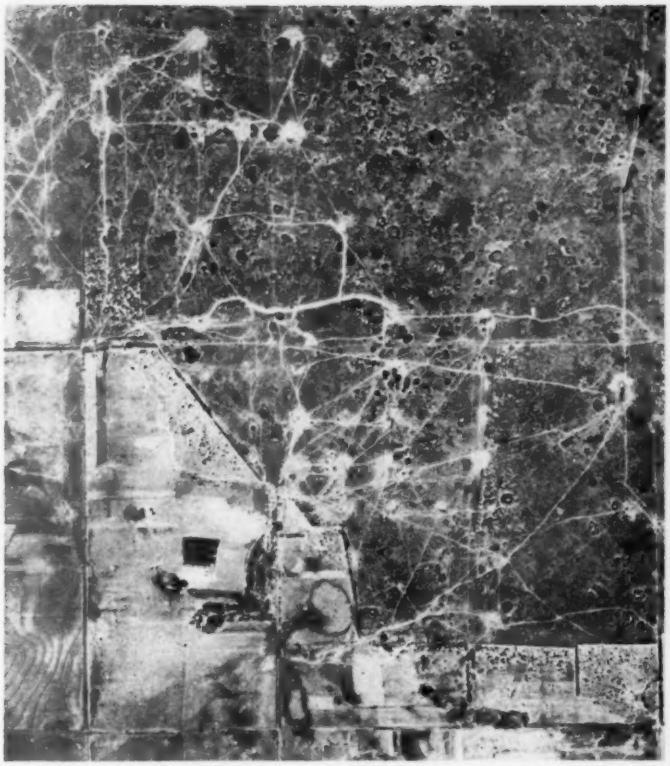
In 1950 there was no exploratory drilling reported for the Tyrrhenian Coastal Plain province of Italy.

Summary

Italy has four favorable areas in which to prospect for oil and gas, namely: (1) the Po basin, (2) Po Delta, (3) Pescara basin, and (4) the Ragusa basin on the Island of Sicily. Production may be expected from sediments ranging in age from Cretaceous to Quaternary in both structural and stratigraphic traps. In many cases it is to be expected that both structure and sedimentation will play a part in the accumulation of commercial hydrocarbons in paying quantities. Under these conditions of accumulation it is necessary that the careful detailed geophysical studies be correlated with detailed subsurface and stratigraphic analysis.

Geophysical prospecting in the past has been of three types: (1) gravimetric, (2) reflection seismograph, and (3) magnetic. In most cases the geophysical work has been done by German scientists and companies in the employ of the companies operating in Italy.

The success of the various geophysical methods is shown by the increased production obtained through exploratory drilling following the exploration campaigns of 1926-1933 and 1933-1939. The recent upward trend in Italian production is due in part to the restoration of production facilities following World War II, and in part to the use of American geophysical crews and American-trained scientists who are more apt to modify interpretative methods and work patterns to fit the existing geologic conditions than those who are German trained.



AERIAL VIEW of oil-producing properties near Snyder, Tex., one of the types of ready-made air photography in the archives.

Uncle Sam may have just what you need in

Ready-Made Air Photography

And there are services available to help you find out if what you need is on file and to secure it for you

by H. G. Maas*

TEN federal Government agencies, some states, and private agencies have expertly photographed almost all United States areas from the air for their own purposes.

The uses of air photography in the oil industry are well recognized. Inexpensive stereo prints of ready-made photography will usually reveal significant geological facts, regional trends, basement structures, etc., and can be a profitable guide before costly ground studies are started or specialized air surveys are flown in exploration work.

Many areas have been photographed several times because of the diversity of the needs of the various agencies making photographs. Each federal government agency is set up by law to operate separately and has complex regulations, specifications, negative files, and widely separated offices. New photography is constantly being added. Some, of course, is much better than others for specific uses. Some mosaics, aeromagnetic data, etc., are available.

A real job to obtain . . . In the case of federal government agencies, stereo prints from flight negatives and prints from mosaics are made by their photolabs for private use under changing security and other regulations. Prices are near print costs without charge for the vast flying and photography expenditures paid from public funds. Thus these prints are an outstanding bargain. However, the purchaser has the onerous burden of locating the negatives most desirable to his purpose and most up to date; he must also find out whether they are available under existing security and other regulations. In some instances, clearance or even information on desirable aerial photography made, is subject to decision of government officials; it is related to the intended use of the photography or even whether or not the prospective user has failed to find his needs elsewhere.

Private print orders wait until print orders for government use are filled. Private purchasers must order separately from each agency holding the desired coverage and usually must make exact prepayment. Amounts depend upon the number of negatives required to cover an area, and in most instances several agencies are involved. Print orders of course require official negative numbers which have to be researched from each agency. This research and procurement work can add up to a big undertaking in terms of a user's time. It also requires specialized knowledge.

The numerous agencies holding various coverage have to write each other official letters forwarding letters from print users for action. This adds to the delays, uncertainties, and complications of endeavoring to research and procure the best photography for a specific purpose by means of correspondence. Too, the agencies are usually prohibited by pressure of their primary official work from rendering detailed, specialized assistance to private users—not being sufficiently staffed for such assistance. Nor can they perform a coordinated procurement job for a user; the law sets them up separately.

Foreign photos . . . The subject of research and procurement of ready-made aerial photography of foreign areas is a complex one. There are numerous sources of foreign aerial photography and complicated problems. In Washington, D. C., there are probably the world's best facilities for researching, clearing, and procuring prints of foreign photography. Each case requires its own research and other procedures as a rule, the Washington official staffs of foreign governments usually having to be brought into the negotiations.

*Washington Commercial Co. (a business research firm), Washington, D. C.

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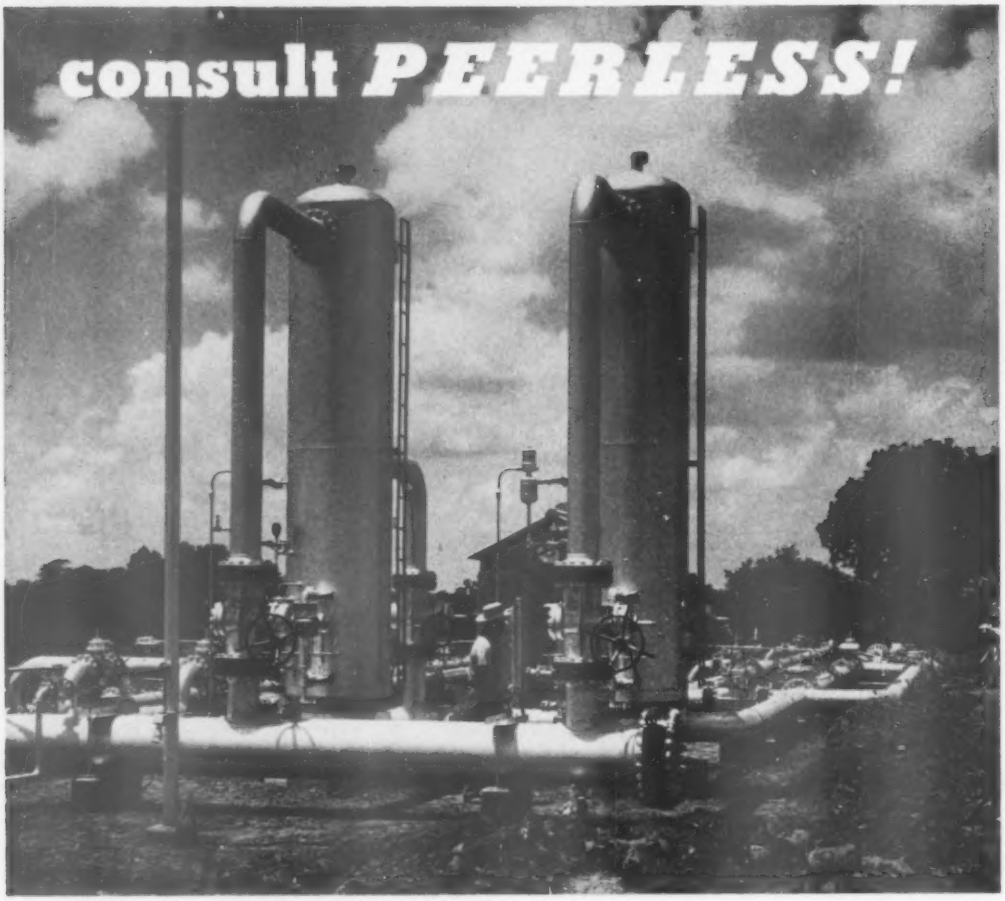

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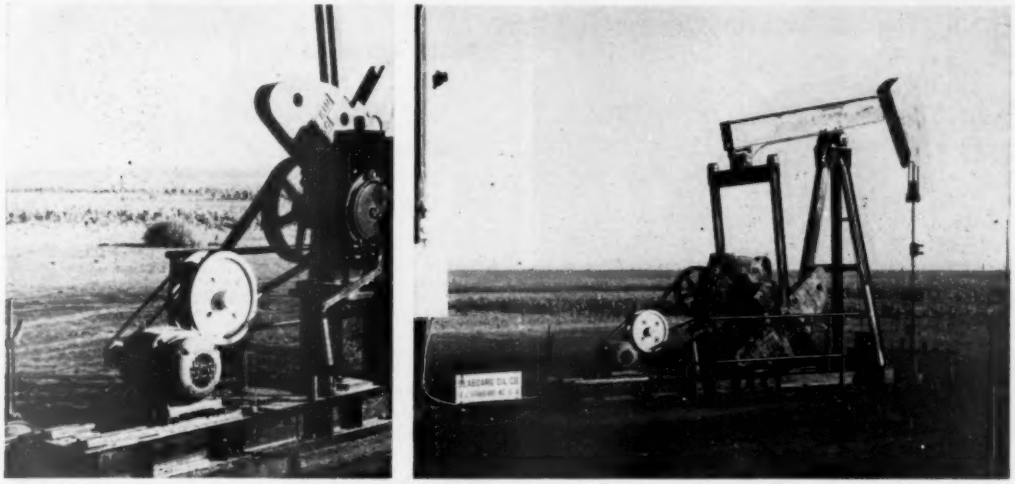

FLYING SHEAVE makes change from low-speed driver to high-speed driver on unit with single reduction gear box. Left, closeup of the installation. Right: View of sheave in relation to pumping unit.

Pumping Unit Converted

Flying sheave solves problem of changing low-speed driver to high-speed driver on pump with single-revolution gear

Roy F. Carlson

CHANGING from a low-speed driver to a high-speed driver on a pumping unit equipped with a single reduction gear box can become complicated and expensive if the pumping unit is to be kept as it is. One answer to a successful change is the flying sheave, such as is used by Seaboard Oil Co. in Spraberry Deep field of West Texas.

In this instance, a gas engine was replaced with an electric motor, but the operators wanted to keep the single-reduction pumping unit that was in place at the well. With just the single-reduction gear box in the unit, the motor would have driven the unit too fast, or the sheave on the motor would have been too small for effective and efficient use, and the sheave on the unit would have been too big. Another answer would have been to use two sheaves mounted on the engine and unit skid.

More bearings used . . . The separate shaft involves the use of additional bearings and also requires careful alignment. This flying-sheave alternative was substituted and has worked satisfactorily. The unit actually consists of three aluminum sheaves mounted on a short shaft—two large sheaves on the outer ends of the shaft, and a smaller one between the two. A special sheave with grooving matching the two large outside sheaves was fitted to the motor.

Two sets of four exactly matched steel-cable-cored V-belts were then fitted to the sheaves as shown in the above photographs, the sets being 90 and 120 in. in length. When the engine was set with the proper tightness in the belts the flying sheave was suspended as shown, providing the proper reduction.

Sizes are 5-in. motor sheave, to 19½-in. flying sheave. The center of the suspended sheave is 8-in. in diameter driving a 23-in. sheave on the unit. The motor turns at about 1,200 r.p.m., and the unit has a 10 to 1 reduction, making it deliver on the order of 10 s.p.m., the desired speed. The sheave is manufactured by Lufkin Foundry & Machine Co.

Cleaning Gathering Lines in West Texas

Maintenance of gathering and storage facilities in oil fields, particularly those producing sour crudes or other corrosive fluids, is a continuing problem. Cleaning and internally coating lines in place is one solution of maintenance. This picture shows scale, loosened from the walls of a line in West Texas, being blown from the pipe by compressed air, which is also used to power the cleaning tools.

TAKES ONLY MINUTES to empty waste crude from a sump with this 45-bbl. Thompson Unitized Vacuum Tank. (Note still-wet sump wall.) One operator handles loading, transportation and unloading. This means economy!

ONE MAN moves liquids or semi-solids *FAST!*

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Drop-in a hose line and turn on the pump. That's all there is to it with a Thompson Unitized Vacuum Tank on the job. Discharging is just as easy. The Thompson Tank is a complete unit designed to handle all oil field work — cleaner, faster *(up to 50 percent!)* and at lower cost. Cleans tanks, sumps, cellars, cooling tower basins; clears plugged lines; transfers brine, crude, mud and caustics; puddles trenches; sprays dikes, roads, weeds.

VACUUM OR PRESSURE: The Thompson exclusive vacuum-pressure feature and self-contained unit provide pickup or discharge where needed. Use pressure to puddle trenches and for quick emptying of tank. Thompson Tanks are long-lived; no part of the load—*nothing but air*—passes through the pump, thus eliminating abrasive action and minimizing wear.

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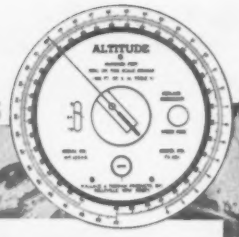

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SELF BALANCING PRINCIPLE. No adjustment or setting is required. There is no lag.

CALIBRATION. Scales are individually drawn for each mechanism and require no correction.

DURABILITY. The mechanism is simple and is shock-proof mounted within the instrument case.

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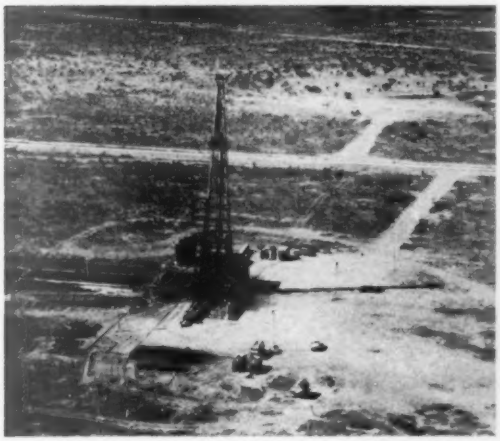
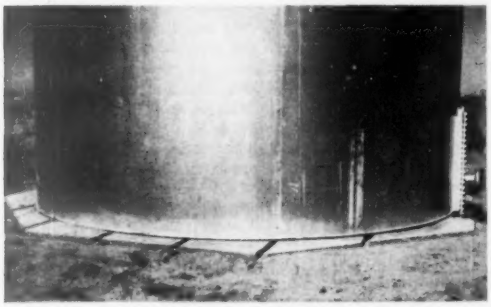


Air Drilling From the Air

A FEW months ago Wilshire Oil Co., Inc., in West Texas did some pioneering work in rotary-well completion, using compressed air. Western Natural Gas Co. is now drilling in Val Verde County, Texas and has recently made rather spectacular time in using compressed air as a drilling fluid. Some footage has been cut at about 200 ft. per day, which in the particular section and territory is considered "good going."

Sulfur From Sour Gas

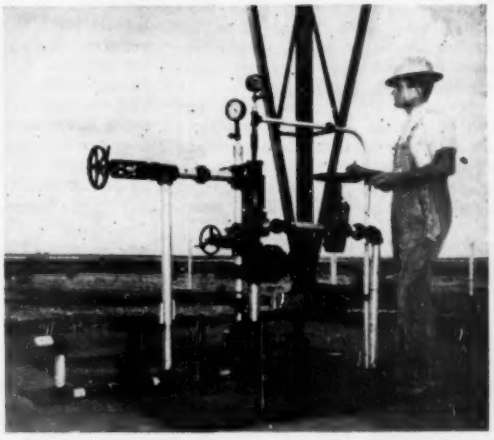
SULFUR from sour oil-field gases makes its way into many different products through a variety of channels. One of the stopping points is pictured above—a bulk-sulfur-storage bin located southwest of Odessa, in West Texas. The sulfur is produced from sour gases in plants located in or near West Texas gasoline plants from concentrated sour gases taken from sweetening units. Sulfur is still in short supply.



Grade Helps Stop Corrosion

TANK-BOTTOM corrosion is often aided by lack of a suitable grade underneath the tank to permit moisture to drain away from the tank bottom and keep the bottom plates dry. In a permanent type of tank installation the concrete pad shown above on a tank in West Texas will permit such moisture drainage and provide ventilation beneath the tank, while still providing adequate support.

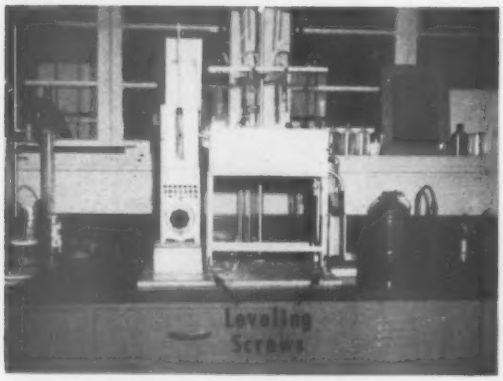
The grooves shown are about 2-in. square, and run parallel to each other across the pad. Adequate support is given by the intervening concrete, and these supporting surfaces are drained of collected water by the neighboring drainage grooves. Enough space is also provided for circulation of air underneath the tank to remove water vapor from beneath the tank.



Hydraulic-Pump Well Head

THREE strings of tubing, two concentric and one parallel, run inside the casing on this dually completed well. One-inch tubing on this West Texas well is run inside 2-in. tubing for a bottom-hole hydraulic type of pump to take production from one horizon.

Another string of 1-in. tubing parallels the others, and is fitted with gas-lift valves to produce the second zone.



DISTILLATION-TEST apparatus includes leveling screws on tank base, fluorescent lighting, and flask and graduate racks.

AIR-OPERATED STIRRER uses intermittent flow of air into metal tube to move cork, then stirrer, in vertical direction (see drawing).

Equipment additions and revisions

Make your laboratory more efficient

F. Lawrence Resen

A LITTLE initiative, coupled with some handiwork, can go a long way in improving a laboratory's appearance, efficiency, and safety.

Such a course has been followed at McKamie Gas Cleaning Co.'s Magnolia, Ark., plant, where many improvisations on various pieces of equipment have enhanced laboratory working conditions.

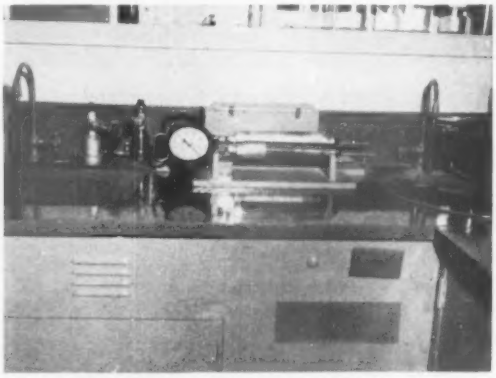
Several of the schemes shown here can be used in almost any laboratory since they involve standard tests and equipment; others may be readily adapted to meet particular laboratory setups. The most significant point, however, is the realization that substantial improvements can be made to most pieces of laboratory equipment.

Distillation . . . One of the most common tests run in a plant laboratory is the Engler distillation test, involving a heating unit, distillation flask, thermometer, condenser tube in water or ice-bath tank, and a graduate for collecting distilled components. In running the tests, two difficulties are normally encountered: Reading the thermometer and adjusting the position of the flask so that its outlet stem may be placed within the condenser tube.

To make thermometer readings more easily, a fluorescent lamp was installed behind the flask, providing illumination directly in back of the thermometer. A small metal shield to cut down the glare was placed in front of the flask with an opening provided for obtaining necessary readings.

As an aid in adjusting the position between the distillation flask and condenser tube, a permanent platform was provided for all of the distillation apparatus. Nuts were welded to the base of the distillation tank and butterfly bolts used to make up into these nuts and the base of the platform. The heating unit is maintained at a constant height and whenever adjustments

IN ELECTRICAL conductivity test, a ½-in. bolt serves to support clamps, thereby doing away with cumbersome ring-stand.



REID VAPOR-PRESSURE test bombs are placed in mounting when not in use, with thermometers inserted in each.

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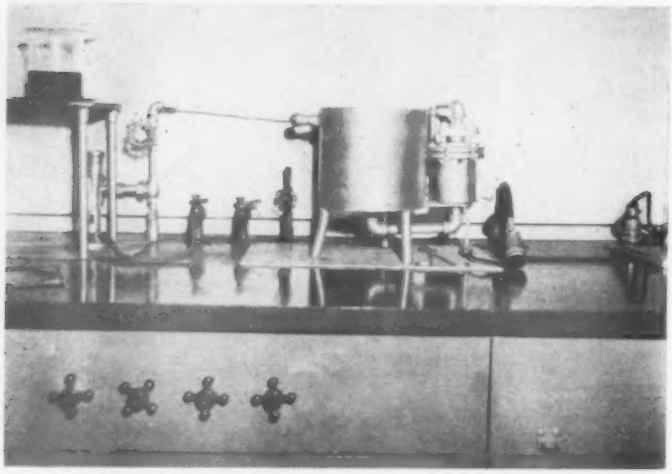


STEAM HEATER was constructed from old casing. Adjacent trap is used to remove water from system.

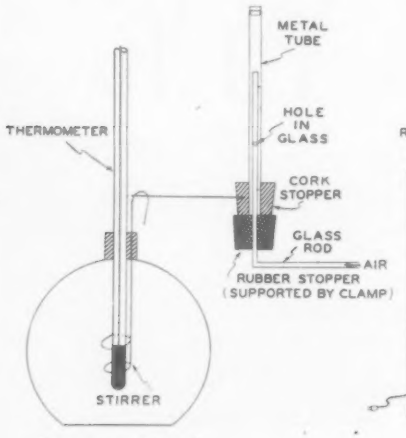
have to be made, the butterfly bolts are used to raise or lower the tank as required.

A ring stand, also mounted on the platform, is used to support racks holding additional flasks, graduates, and funnels. A length of hose runs from the drain cock on the tank to the sink.

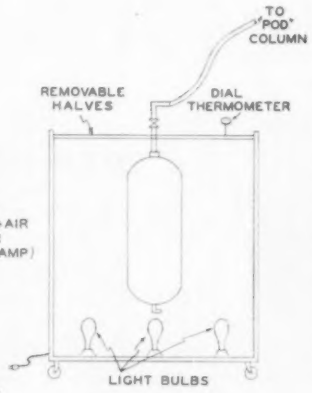
R.v.p. apparatus . . . The bomb, plus pressure-gage attachment used in Reid vapor-pressure test has been provided with a wooden cradle mounting for storing the bomb when not in use. This mounting consists of two pieces of wood, with semicircular sections cut out, placed in a vertical position on a wooden platform.

The bomb is then placed in a horizontal position with the thermometer, used to check the bomb's internal temperature, inserted. The bomb is thus ready to use and the pressure gage is not subjected to the wear and tear which occurs when the bomb is merely stored on a cabinet shelf.

Stirrer . . . In running molecular-weight determinations, it is important to keep contents of the heating vessel continually agitated to establish a uniform temperature throughout. To accomplish this, an air-operated agitator has been constructed which moves a wire-ring stirrer vertically past the thermometer bulb.



Thermometer "stirrer."



"Pod" bomb heater.

To achieve the vertical movement of the stirrer, air is passed through a glass tube over which is placed a metal tube, blocked off at one end. A cork stopper is attached at the open (downward) end of the metal tube and a wire runs in a horizontal direction from this stopper. The stirrer is hooked over this wire so that as the cork stopper moves in a vertical direction, the stirrer will be motivated by the horizontal wire.

Air passed through the glass tubing affords a lifting motion to the metal tube and causes it to rise, carrying cork stopper, metal wire, and stirrer upward. As the metal tube rises, it passes over a hole cut in the glass tubing. Air, which was previously forced against the tube causing it to lift, can thereby escape without restriction and no longer supports the metal tube, which then falls back into place as does the stirrer. However, once the hole in the glass has been covered by the metal tube, air pressure begins building up to raise the tube in a vertical position again, and thus the cycle is repeated, giving a continuous stirring action within the measuring vessel.

Steam heater . . . To provide a low-temperature heater for various laboratory uses, a heating chamber was made from an old piece of casing welded at both ends with plate steel. Steam from a regular plant steam line is passed through the chamber and provides even heating to the plate on the top of the chamber. A regular trap is tied into the system to remove water.

Bomb heater . . . A movable cabinet for heating Podbielniak column bombs to insure complete vaporization of contents, is also part of the lab equipment at McKamie's plant.

To use the cabinet, the laboratory technician removes the top cover which consists of two removable half-sections, and places the bomb in the cabinet. The sections are placed back in position and a dial thermometer inserted through a hole cut in one of the sections. The electric lights are turned on and the bomb allowed to heat. After sufficient time has elapsed to bring the bomb to the desired temperature, the bomb is connected to the "Pod" column and charging of the column with the sample to be analyzed takes place with the bomb still in the cabinet. The entire cabinet is mounted on casters so that it may be conveniently moved. Chief plant chemist for McKamie is D. L. Farley.

THE JOURNAL'S WEEKLY
Engineering Reference
SECTION

THE CENTRIFUGAL COMPRESSOR—4

Station Operation

by C. F. Koenig, III*

FIG. 1 shows typical performance of a compressor equipped with adjustable inlet guide vanes. It is seen that preswirl with the rotation reduces the head and the flow for best efficiency, while preswirl against the rotation increases the head and the flow for best efficiency. It is also apparent that the peak efficiency deteriorates slightly with preswirl in either direction. This is due to turning losses in the inlet guide vanes and slightly increased losses in the fixed impeller, diffuser, and volute passages at flows different from the design flow. An illuminating discussion of the advantages of centrifugal pipe-line compressors equipped with adjustable inlet guide vanes has been published recently[1].

Many curves and charts have been developed to illustrate the operation of a centrifugal compressor station in a pipe line. It may almost be said, in fact, that there are as many types of operating curves as there are pipe lines. Two types of presentation have been particularly well received and will be described here.

Fig. 2 shows the operating characteristics of a four-unit centrifugal station pumping against a constant discharge pressure. Assuming that the discharge pressure is maintained and that the suction pressure will vary with flow according to the characteristics of the pipe line, this curve shows, for any suction pressure, the flow, speed of the machines, number of machines that should be operating, and the total horsepower required. The curve cannot be applied where the flow-pressure relationship varies from that shown, but it is feasible to prepare several plots for the same machinery operating under different flow-pressure relationships.

Centrifugal compressors have thus far been considered principally for use in large pipe lines where the gas flow is 300 million standard cubic feet per day or higher. The high-specific-speed impeller mentioned above is a major development for pipe lines which carries 1 billion or more standard cubic feet of gas per day. On the other end of the scale, thinking is now turning toward small-flow pipe lines and feeder lines where a single-stage centrifugal compressor will not usually deliver a high enough pressure ratio or absorb enough power to make its use attractive. The solution here seems to be multistage compressors, and such machines are being seriously considered. Multistage compressors are, of course, commonplace in other fields, but the requirements of pipe lines engender certain special problems which must be carefully analyzed before multistage pipe-line compressors become production items.

*De Laval Steam Turbine Co. From paper presented at A.S.M.E. meeting, Kansas City, Mo., 1952.

Reference

(1) "Centrifugal Compressors of New Design," by C. W. Marvin, Petroleum Engineer, May 1952.

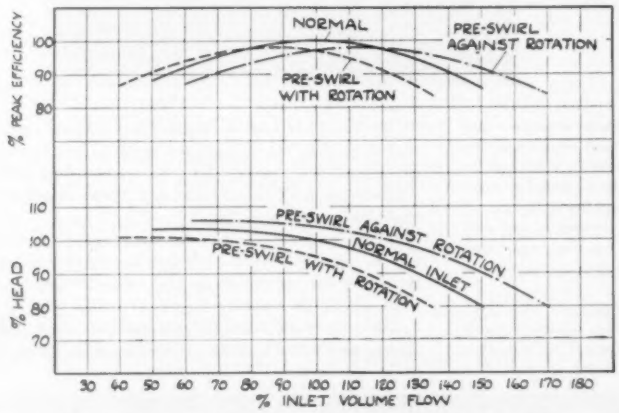


Fig. 1—Constant-speed performance with adjustable inlet guide vanes.

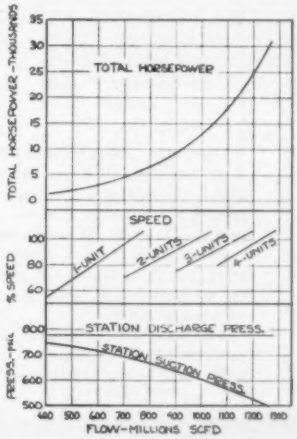


Fig. 2—Four-unit compressor station.

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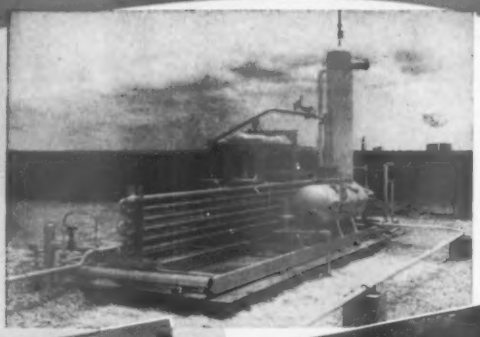

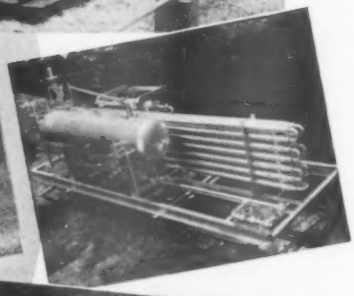

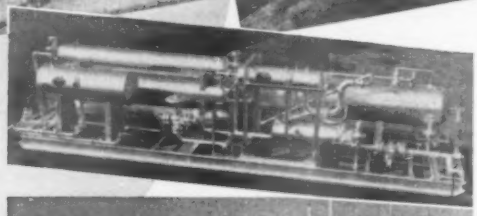

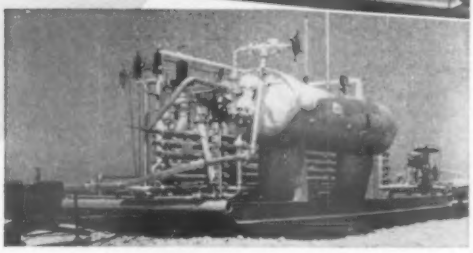

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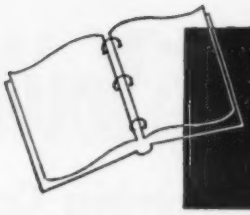

REFINER'S NOTEBOOK

Modern Bubble-Tray Construction—2

by H. C. Glitsch* and R. W. Fowler*

SINCE 1936, bubble caps and bubble trays of the "truss type" construction have been fabricated ranging from 28 in. to 33 ft. in diameter. Trays have been made out of the following materials:

Carbon steel, 4-6 per cent chrome, 11-13 per cent chrome, 17 per cent chrome, red brass, 18-8 Type 304, 18-8 Type 347, 18-8 Type 321.

18-8 Type 316, Monel, Inconel, Hastelloy, Everdur, copper, aluminum, nickel, and some of the other nonferrous alloys such as Muntz metal and Ampco metal. By selection of the proper corrosion-resistant material, only structural strength must be considered without regard for additional corrosion allowances. In this manner, the truss-type construction offers the economical solution to a possibly otherwise prohibitive cost for stainless-steel bubble trays.

Stainless steel . . . It is interesting to note that in the petroleum industry 11-13 per cent chromium Type 410 stainless steel has done an outstanding job of providing an economical material that is resistant to many of the corrosion problems.

For wet corrosion in the upper sections of bubble towers where the temperature may be below the dew point of water resulting in small amounts of hydrochloric acid on the trays, the usual material has been Monel; although some operators have found 18-8 moly Type 316 satisfactory. This is likely due to the fact that in these cases the corroding agents causing the trouble in the wet corrosion are organic acids, such as acetic, propionic, possibly naphthenic, H_2S, SO_2, or SO_3, rather than hydrochloric acid.

For naphthenic acid corrosion, a West Coast refiner has found that aluminum has given him acceptable results. Aluminum is, of course, limited to the lower ranges of temperature usually below 300° F. Some operators have found aluminum trays to be the answer in temperature ranges as low as minus 320° F. due to its property of maintaining impact values at these low temperatures.

In vinyl chloride production, Everdur material has been doing a good job of combating corrosion on bubble trays.

Glycol service . . . Both carbon steel and 18-8 have been used for bubble-tray manufacture, with the 18-8 being favored where the prevention of contamination is desired.

For ethylene and styrene service, carbon-steel bubble trays are acceptable to most operators.

M.E.A. service . . . Where the corrosion is somewhat spotty, 18-8 is usually considered the best material; however, carbon steel is probably the most widely used. Under certain operating conditions in M.E.A. service where steel is severely attacked, 11-13 per cent chrome Type 410 has proved satisfactory.

The 18-8 Type 304 is widely used for absorption trays and cooling trays in nitric acid service.

Where acetic acid corrosion is the problem, trays have been furnished from 18-8 moly Type 316. Formaldehyde is usually handled by trays manufactured from 18-8 Type 304.

The corrosion encountered in the production of synthetic ethanol and isopropanol—the "sulfate" process—has been successfully combated with copper or Monel bubble trays.

Some refiners have found 11-13 per cent chrome Type 410 satisfactory for furfural, while others have found 18-8 is necessary due to their specific conditions.

Velocity effect . . . Where velocities are high—causing more erosion—higher corrosive resistance is required, and it has been noted that caps and risers are generally more severely corroded than downcomers, weirs, or tray floors. It has, therefore, proved profitable for some operators to consider the use of stainless-steel caps and risers on removable carbon-steel trays.

In this respect, it is not at all unusual for the carbon-steel trays to be supplied with alloy bolting to assure easy operability of the hardware.

It has been observed that Type 410 stainless-steel bubble trays sometimes will corrode during shutdowns due to "wet corrosion" or to wet salt that is allowed to stand stagnant on the trays. This can be minimized by thoroughly flushing out the bubble towers as soon as the unit is brought down.

It is desirable that the tray sections be designed to pass through the tower manways with the caps in place to obviate the necessity of having to remove all of the caps before removing the sections. Easily removable caps should be provided; thus, when it is necessary to remove all of the caps from the tray floors for cleaning, it can usually be done from the top side of the tray. Whenever it is possible, it is desirable to clean the trays in place without removing them from the tower.

*Fritz W. Glitsch & Sons, Inc. From paper presented at John Zink Process Heating Seminar, Tulsa 1952.

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Oil-field applications for hydraulic equipment include pull-down power for portable drilling rigs, closures on blow-out preventers, bug-blower operation, drives for shale shakers, water pumps, generators, mud pumps and servicing equipment reels, and many other uses too numerous to mention here.

Advantages of hydraulic equipment are almost as numerous as its uses: They offer complete fire-safety — no sparks. They can tap power already available in rotary rigs — no separate generator or other power source is needed. They cut maintenance costs on blow-out preventer equipment because hydraulic fluid is basically non-corrosive and non-abrasive. Existing blow-out hook-ups can be used without change. Blow-out preventers won't freeze. Repair and replacement costs on hydraulic pumps and fluid motors are lower than for other types of prime movers. Fluid motors offer infinitely variable speed at no extra cost, and are not affected in any way by constant starting, stopping, stalling and reversing. Smooth, fluid action of hydraulic equipment reduces wear and tear on equipment generally. There are many other ways in which Denison HydrOILic Equipment can help you get better results, save time, and reduce costs.

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Denison Neale
Manager
Houston Branch

Mr. Neale has had considerable experience in the application of hydraulic components to circuit needs of every type, with special emphasis on heavy industrial requirements. Following an extensive period of specialization in the installation and servicing of hydraulic test stands used in ground-checking aircraft hydraulic circuits, Mr. Neale served as a pilot in the Air Force. Later he returned to Denison for additional training in the engineering, production and application of hydraulic equipment. As a field engineer serving manufacturers in the Midwest, he often encountered many of the specialized problems and needs in the oil industry — a field he has found unusually interesting because of its many opportunities for practical applications of hydraulic equipment.

William D. Peters
Manager
West Coast Branch

Mr. Peters has an unusually wide and varied experience in the engineering, design, and development of hydraulic products as well as in the application of oil-hydraulic methods to industrial production. He has been with the Denison Engineering Company since 1941. After several years in the Engineering Department, he was "drafted" as Sales Engineer in the Pump and Control Division, because of his excellent project development work in Denison's Test Laboratory experiments, in connection with the adaptation of hydraulics to new fields.

This phase of Mr. Peters work has also brought him in close contact with developments in Denison's Aircraft Pumps and Controls, and with the adaptation of hydraulic components to special processes in other fields.

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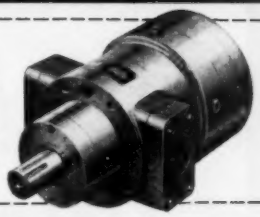
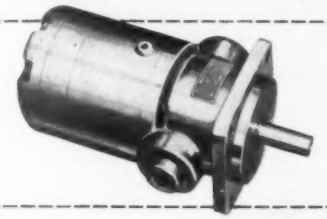
DENISON HydrOILics

PUMPS

Denison offers a wide variety of rugged, hydraulically balanced pumps of efficient axial-piston or vane type design, in 2000, 3000, 5000 psi capacities. Constant or variable volume delivery . . . by handwheel, stem, cylinder, pressure compensation and servo control. 3.5 to 70 gpm capacities. Face, flange or foot mountings.



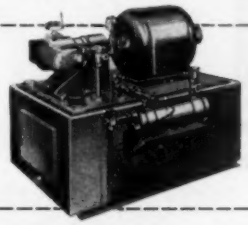


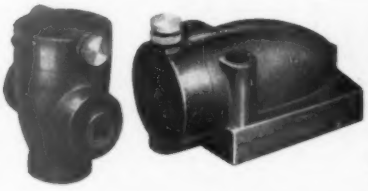
FLUID MOTORS

Denison Fluid Motors provide high torque efficiencies ranging from 13 to 257 inch-pounds per 100 psi — equivalent to 3 to 160 hp output at pressures to 5000 psi. Both axial piston and vane type motors available. Small, compact, powerful. Maximum operating speeds vary from 1200 to 3000 rpm. Face, flange and foot bracket mountings are available.

PUMPING UNITS

Denison's self-contained Pumping Units offer complete packaged circuits for every need. They feature single-panel assembly of all operating components — pump, motor and valves are mounted on reservoir top. 37 different models provide 2 to 70 gpm delivery capacities, for circuit pressures from 400 to 5000 psi. Constant and variable volume types.



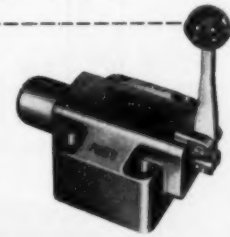


PRESSURE CONTROLS

Unusually low differential between opening and closing pressures is an outstanding feature of Denison's compound-design relief, sequence and unloader valves. Their faster action assures closer control of operating pressures. For circuits up to 5000 psi. No chatter — no pulsation. Threaded body, subplate, or flange-type mountings are available, with provisions for gauge or pilot circuit connection and remote control of pressure unloading adjustment. All sizes: 3/4" to 2".

DIRECTIONAL CONTROLS

A wide choice of porting and operating characteristics are offered in Denison's extensive line of sturdy 4-way valves for all circuit needs to 5000 psi. Seven types of controls for valve operation include manual, hand lever, mechanical stem or cam, hydraulic pilot with or without throttle control, and single or double electric solenoid, and solenoid with pilot control of spool movement. Threaded or subplate body types are available in 1/4" to 1 1/2" sizes.



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Part 21 of a series

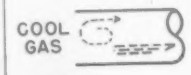
by Dr. B. E. Lauer, Head, Department of Chemical Engineering, University of Colorado

h_f HEAT TRANSFER

COEFFICIENT of HEAT TRANSFER through FILM between INSIDE of WARM TUBE and COOL GAS

Tube Position: Horizontal

Gas Movement: Combination of streamline flow and free convection.



EQUATION:

$$h_f = 1.86 \frac{K}{D}\left[\frac{DV\rho}{\mu}\right]^{\frac{1}{3}}\left[\frac{C\mu}{k}\right]^{\frac{1}{3}}\left[\frac{D}{L}\right]^{\frac{1}{3}}\left[\frac{\mu}{\mu_s}\right]^{0.14}\left]2.25\frac{[1+.01Z^{\frac{1}{2}}]}{\log_{10}\left[\frac{DV\rho}{\mu}\right]}\right.$$

where $Z = \left[\frac{D^2\rho^2 g \beta \Delta t\, q}{\mu}\right]$

TERMINOLOGY:

h_f - Film coefficient of heat transfer, BTU/hr. sq. ft. $^{o}F.$

K - Thermal conductivity of gas, BTU/hr. ft.^{2} $^{o}F./ft.$

D - Diameter of tube, ft.

g - Acceleration of gravity. 4.17×10^8 ft./hr.^{2}

μ - Viscosity of gas, lb./ft. hr. μ_w - Wall temperature.

C - Specific heat of gas at constant pressure, BTU/lb. $^{o}F.$

L - Heated length of tube, in ft.

ρ - Density of the gas, lb./cu. ft.

β - Coefficient of volumetric expansion of gas, for ideal gas is equal to $1/^{o}R.$

Δt - Temperature difference between wall and gas, $^{o}F.$

LIMITATIONS:

This equation applies to fluids flowing at extremely low velocities through horizontal tubes. In this situation material differences in tube and liquid temperatures cause considerable free convection. In most cases involving gases, or even liquids of reasonably low viscosity, turbulent flow is nearly always encountered.

SOURCES OF DATA:

For physical constants for use in above equation see Chemical Engineers' Handbook - J. H. Perry (1948).

for ρ -- see pp. 130-148, 175-195, 1583.
μ -- see pp. 370-374, 1198, 1696.
β -- see pp. 200-202.
k -- see pp. 459-461, 1303, 1697.
C -- see pp. 225-235, 297, 1588, 1696.

REFERENCES:

1. Process Heat Transfer, Kern, p. 206.

2. Sieder, E. N. and Tate, G. E., Ind. Eng. Chem. 28, pp. 1429-1436 (1936).

F 4 b (1) (a)

COEFFICIENT of HEAT TRANSFER through FILM between INSIDE SURFACES of a COOL TUBE and WARM LIQUID

Tube Position: Horizontal

Liquid Movement: Turbulent

Special Consideration: Liquids of low viscosity.

EQUATION:

$$h_f = 0.0265 \frac{k}{D}\left[\frac{DV\rho}{\mu}\right]^{0.8}\left[\frac{C\mu}{K}\right]^{0.5}$$

TERMINOLOGY:

h_f - Film coefficient of heat transfer, BTU/hr. sq. ft. $^{o}F.$

k - Thermal conductivity of liquid, BTU/hr. sq. ft. $^{o}F./ft.$

ρ - Density of liquid, lbs./ft.^{3}

D - Inside diameter of tube, ft.

V - Velocity of liq., ft./hr.

μ - Absolute viscosity of liquid, lbs./hr. ft.

C - Specific heat of liquid, BTU/lb.$^{o}F.$

LIMITATIONS:

Reynolds number ($DV\rho/\mu$) should be 2100 - 10000.

Equation best for low viscosity liquids.

SOURCES OF DATA:

For physical constants for use in above equation see Chemical Engineers' Handbook - J. H. Perry (1948).

for ρ -- see pp. 130-148, 175-195, 1583.
μ -- see pp. 370-374, 1198, 1696.
k -- see pp. 459-461, 1303, 1697.
C -- see pp. 225-235, 297, 1588, 1696.

REFERENCES:

1. Heat Transmission, William H. McAdams, pp. 168.

2. Applied Heat Transmission, Herman J. Stoever, p. 57.

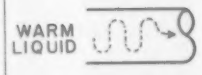
F 2 c (1)

COEFFICIENT of HEAT TRANSFER through FILM between INSIDE SURFACE of a COOL TUBE and a WARM LIQUID

Tube Position: Horizontal

Liquid Movement: Turbulent

Special Consideration: Liquids of medium to high viscosity.



EQUATION:

$$h_f = 0.027 \frac{k}{D}\left[\frac{DV\rho}{\mu}\right]^{0.8}\left[\frac{C\mu}{k}\right]^{0.33}\left[\frac{\mu}{\mu_s}\right]^{0.14}$$

TERMINOLOGY:

h_f - Film coefficient of heat transfer, BTU/hr. sq. ft. $^{o}F.$

K - Thermal conductivity of liquid, BTU/hr. sq. ft. $^{o}F./ft.$

D - Inside diameter of tube, ft.

V - Velocity of liquid, ft./hr.

ρ - Density of liquid, lbs./ft.^{3}

μ - Absolute viscosity of liquid, lbs./hr. ft.

C - Specific heat of liquid, BTU/lb.$^{o}F.$

μ_s - Absolute viscosity of the liquid at wall temperature.

LIMITATIONS:

Reynolds number ($DV\rho/\mu$) must be over 2100, preferably above 10,000.

Equations most suitable for liquids of high viscosity.

SOURCES OF DATA:

For physical constants for use in above equation see Chemical Engineers' Handbook - J. H. Perry (1948).

for ρ -- see pp. 130-148, 175-195, 1583.
μ -- see pp. 370-374, 1198, 1696.
k -- see pp. 459-461, 1303, 1697.
C -- see pp. 225-235, 297, 1588, 1696.

REFERENCES:

1. Heat Transmission, William H. McAdams, p. 168.

2. E. N. Sieder and G. E. Tate, Ind. Eng. Chem., 28, 1429-1436 (1936).

F 2 c (2)

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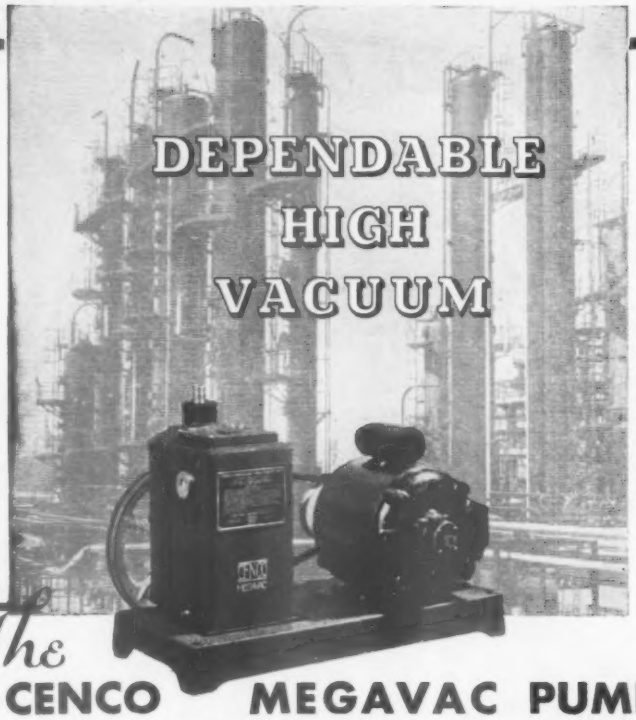

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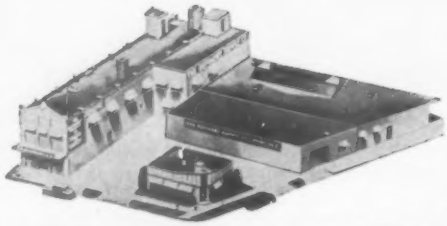

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QUESTIONS ON TECHNOLOGY

by W. L. Nelson
Technical Editor

Penalty for "Sourness" In a Crude Oil

"In several of your Questions on Technology, you have discussed 'sour' crude oils. Are these crude oils sold at lower prices, or what is a proper price for them?" R.A.N.

No clear practice regarding the pricing of sour crude oils is evident, and this reluctance to state definite penalties is perhaps related to the confusion or difficulty in distinguishing between sour and high-sulfur crude oils.

Sour crude oils are those that contain more than 0.05 cu. ft. of dissolved hydrogen sulfide in 100 gal. of oil. High-sulfur crude oils may not be sour but they contain variously 0.5 per cent sulfur in most regions, whereas in other regions 1.0 per cent is considered as the dividing line.

Thus, in determining the extra costs that are involved in the handling and refining of sour crude oils, it is necessary carefully to distinguish between the effects of sourness, and the difficulties that are promoted by sulfur-content alone. Sour crude oils cause corrosion in refinery crude-storage tanks, in the topping plant, and up to the points where distillates can be contacted with caustic soda. In addition, the gasolines from sour crude oils, even after they have been "sweetened" by chemical treatment, usually contain more sulfur than the straightrun gasoline from "sweet" or even "high-sulfur" crude oils. This causes the lead susceptibility of the gasolines from sour crude oils to be poor. Finally, safety precautions are necessary in handling sour oils because of the exceedingly toxic nature of hydrogen sulfide. As little as 0.1 per cent hydrogen sulfide in a gas will cause death within 30 minutes.

High-sulfur crude oils also liberate hydrogen sulfide when heated to 400° F. or more, and this leads to corrosion and high maintenance costs in all parts of the refinery past the topping plant or first flashing operations. However, these costs are common to both sour and high-sulfur crude oils and hence they should not be charged as a penalty against sourness.

Something can be learned of the value of sour crude oils by the posted Price Schedules of Platt's Oil Price Handbook. The 1950 edition provides the data of Table 1.

TABLE 1—PRICES OF SOUR AND SWEET CRUDE OILS, DOLLARS PER BBL.

	West Texas 30°-30.9° A.P.I.	La.-Ark. 30°-30.9° A.P.I.	Wisner, Mich.	Dorcheat-Macedonia, Ark.
Sweet	$2.45	$2.43-2.55	$2.72	$2.85
Sour	2.32	2.36-2.41	2.54	2.80
Difference, ct./bbl.	13	7-14	27	5

In general, the gasolines from sour crude oils require 1 to 1½ cc. more of tetraethyl lead fluid than low-sulfur gasolines (Refiner's Notebook No. 63, Lead Response of Gasolines, Straightrun and Natural, The Oil and Gas Journal, October 13, 1945, p. 145). The cost of the extra tetraethyl lead fluid (0.22 cent per cc.) that is required for straightrun gasolines is indicated in Table 2. Even greater penalties are actually involved because even with extra lead, the octane number of the gasolines is too low for easy marketing.

Even though the crude oil enters the refinery through a stabilizer it is still necessary to neutralize an excess of mercaptans by means of caustic. Gasolines from sour crude oils may contain 10-15 times as much mercaptans as other gasolines (Waite and Aitkin, "Problems . . . Refining of Sour Grades," The Oil and Gas Journal, August 5, 1943, p. 27). The total extra costs that are involved when handling "sour" crude oils by the method of stabilization (30,000 bbl. per day capacity) is indicated in Table 3.

It is obvious that in smaller plants, the cost of stabilization will be larger (by perhaps 1½ cents per barrel).

If stabilization is not practiced, corrosion will occur throughout the crude and topping-plant storage and the topping plant, and the sulfide must be removed by caustic washing or chemical treatment. In addition, the expenses of maintenance, safety, and inspections in the topping plant will be larger. Finally, the combined corrosive action of sulfide and hydrochloric acid is so troublesome that the desalting or settling system for the crude oil must be more complete than in most refineries. The sum of all these effects is shown in Table 4.

TABLE 2—EXTRA COST OF TETRAETHYL LEAD FOR GASOLINES FROM SOUR OILS

A.P.I. of crude oil	Approx. per cent gasoline	Cost (extra) for lead, ct./bbl. crude oil 0.5 cc.	1.0 cc.	1.5 cc.
25	21	0.8	1.9	2.8
30	27	1.2	2.5	3.7
35	30	1.4	2.8	4.2
40	34	1.6	3.1	4.7

TABLE 3—EXTRA COST OF PROCESSING SOUR CRUDES BY STABILIZATION, CENTS PER BARREL

		Cents per bbl.
Inferior lead susceptibility		0.8-4.7
Storage of crude oil (10-year rather than 25-year life)*		zero-0.22
Stabilization:		
Heat	0.3 -0.65	
Water	0.1 -0.20	
Depreciation and maintenance	0.25-0.45	
Labor and supervision	0.10-0.25	
Steam and power	0.05-0.10	
Overheads	0.30-0.45	
	1.3-1.8	1.3-1.8
Caustic for mercaptans (0.1-0.2 lb.)		0.4-0.8
Total		4.0-7.0

*Brannon, R. A., Pet. Engineer Reference Annual, 1949, p. D-22, and Nelson, W. L., "Hazards and Corrosion with Sour Crudes," The Oil and Gas Journal, December 16, 1944, p. 107 (Refiner's Notebook No. 22).

TABLE 4—EXTRA COST OF PROCESSING SOUR CRUDES WITHOUT EMPLOYING CRUDE STABILIZATION

	Cents per bbl.
Inferior lead susceptibility	0.8 -4.7
Storage of crude (10-year life)	0.18-0.22
Extra topping-plant maintenance (50 per cent of normal)	0.50-0.85
Caustic and washing operation	0.90-1.65
Extra desalting (20 per cent of normal)	0.15-0.30
Extra supervision—safety and inspection	0.20-0.35
Total, cents per bbl.	4.5-7.0

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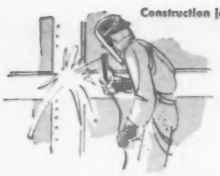
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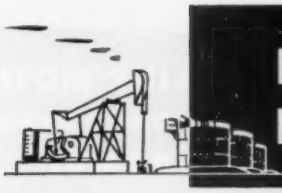

Equations of State—Pure Gases

by Ralph F. Nielsen*

IN the prediction of reservoir behavior and in the estimation of reserves it is important to know the volume occupied by a given weight of the reservoir gas at a given pressure and temperature.

Certain simplifying generalities have been proposed to correlate this material in the case of light petroleum hydrocarbons. Thus, in Nos. 301 and 302 of this series the use of the "compressibility factor" Z was pointed out. If the gas laws are written in the well-known form:

$$PV = ZnRT \qquad (1)$$

the departure of Z from unity is a measure of the deviation from the perfect gas laws.

The volume of a single-component gas depends on the temperature and pressure, and one may therefore show the relations by a series of "isotherms" or plots of P vs. V at constant T (Fig. 1). At low pressures and temperatures well above the critical the relation $PV = nRT$ applies, and the isotherms become hyperbolical at the extreme right. At some constant temperature below the critical the volume decreases with increase in pressure (lowest curve on the right) until the dew point is reached, where the gas may be liquefied at constant pressure. The continuation of the curve at the left is for the liquid. At the critical point C the isotherm has a horizontal tangent instead of the discontinuity shown in the lower curve. The isotherm at a slightly higher temperature has a point of inflection.

The best known of the classical equations of state is that of van der Waals:

$$(P + a/V^2)(V - b) = RT \qquad (2)$$

for one mol, where a and b are constants. Near the inflection points the gas is more compressible than given by Boyle's law, that is, it acts as if the pressure were greater than that applied. Hence the term a/V^2 is added to the pressure, the effect being greater with decreasing V (lower T and higher P). This is sometimes called the "internal pressure" and is a measure of molecular attraction or "van der Waals forces." These are the forces which are responsible for the liquefaction of a gas. At very high pressures the gas is less compressible than given by Boyle's law. Here the volume correction b limits the effect on V given by a pressure increase.

*Associate professor, petroleum and natural-gas department, Pennsylvania State College.

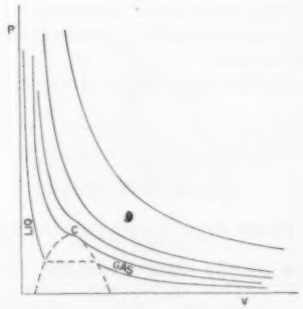

Fig. 1—Lines of constant temperature (isotherms) for a one-component system.

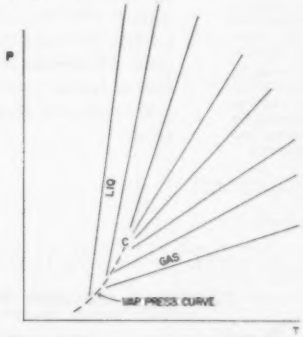

Fig. 2—Lines of constant specific volume (isometrics) for a one-component system.

Instead of plotting lines of constant temperature one may plot lines of constant specific volume (or density) as shown in Fig. 2. If the perfect gas laws are obeyed, these "isometrics" should be straight lines pointing at the origin. Actually they are fairly straight even when deviations from the gas laws are considerable, but they do not all point toward the origin. The lines end at the vapor-pressure curve. If van der Waals' equation is put in the form:

$$P = RT/(V - b) - a/V^2 \qquad (3)$$

it is evident that the isometrics would be straight lines if this equation were obeyed.

In general the isometrics are slightly curved and, besides, one could hardly expect an equation with only two empirical constants to hold over a large range of two variables. Other equations of state have been derived by considering them to be of the form:

$$P = RT/V + \beta/V^2 + \gamma/V^3 + \delta/V^4 \qquad (4)$$

where the terms beyond the first have been called the "virial" and their coefficients the "virial coefficients." The virial coefficients are functions of T and sometimes of volume or density. The equation of Beattie and Bridgman gives for the coefficients:

$$\beta = RTB_o - A_o - Rc/T^2$$
$$\gamma = RTB_ob + A_oa - RB_oc/T^2$$
$$\delta = RB_obc/T^2$$

The total number of constants to be determined from experiment is seen to be five. These have been listed[1] for quite a number of gases. An equation due to Benedict, Webb, and Rubin has nine constants and the virial coefficients are functions of both T and V. The use and the calculation of the constants of these equations constitute a large part of the recent P.V.T. work on petroleum hydrocarbons.[2]

References

1. Beattie and Stockmayer, Chapter 2, Volume 2 of "Treatise on Physical Chemistry," Van Nostrand, 1951 (Taylor and Glasstone).

2. Brough, Schlinger and Sage, Ind. Eng. Chem., Vol. 43, p. 2442 (1951).

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GALVANIC CORROSION—4*

Survey Methods and Equipment

NOT only do transmission and distribution properties encounter those galvanic cells, but they can also be found on production property. Fig. 11 illustrates a dissimilar electrolyte galvanic cell that may be found on production property. The casing and tubing of the well go through many different kinds of soil between the top of the ground and the producing sand. Any two of these may have enough dissimilarity to form a galvanic cell. There may be additional galvanic cells of the same type between the well line and the casing near the top of the well. In some areas, the current flow in the casing and well line has been found to be exactly the opposite of that shown in this diagram. Under such conditions, the casing of the well becomes the anode and will be corroded, while the well gathering line is the cathode of the cell and does not corrode. The current returns to the anode area by passing through the pipe metal of the well line, down through the "top fittings," and into the casing to return to the anode area.

All of the discussion up to now has been to show the many different types of galvanic cells that can occur along our more than 30,000 miles of pipe line. It now remains for us to describe how we determine the actual location of these galvanic cells on existing pipe lines.

*Taken from A Manual on Underground Corrosion, Columbia Gas System Service Corp.

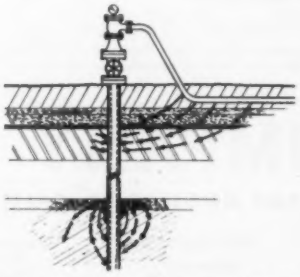


Fig. 11—Ways in which well corrosion can occur.

Survey methods . . . Probably one of the earliest methods of anticipating corrosion on pipe lines was to conduct a soil-resistivity survey along a right-of-way before or after a line had been constructed.

Various instruments can be used to determine soil resistivities. Some of these are: Shepard Canes, the Columbia soil rod which measures the electrical conductivity of a soil, a ground resistance Megger, and numerous others. All these instruments give indications of the resistance of the soil to the flow of electric current, thereby giving more idea of the ability of the soil to transmit corrosion currents.

As shown earlier in this series, dissimilar electrolytes, or soils, can create galvanic corrosion cells. In-as-much as the electrical resistance, resistivity, of various soil types will vary over a wide range, it is possible to determine the location of corrosion cells that may be caused by a pipe line passing through dissimilar soils. While this method of determining whether a soil will support active corrosion has wide acceptance when used before a line is constructed, there are other methods that will supplement the soil corrosion survey information by providing more accurate and specified data on the corrosion of pipe lines that are in service.

Determination of the location of anodes and cathodes along the surface of an underground structure, such as a pipe line, is accomplished by making a potential survey of the earth in the vicinity of the pipe line. On most of our lines, this survey is made by using a copper sulfate half-cell electrode (Fig. 12).

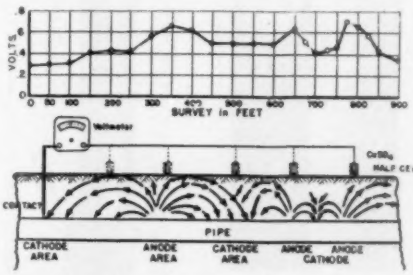


Fig. 13—Corrosion survey profile shows how tests are made at 50-ft. intervals along pipe line.

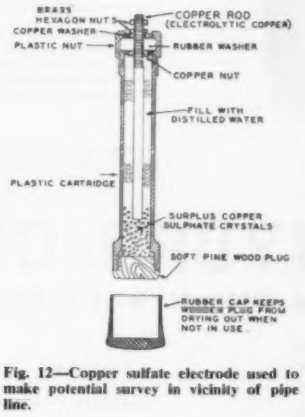
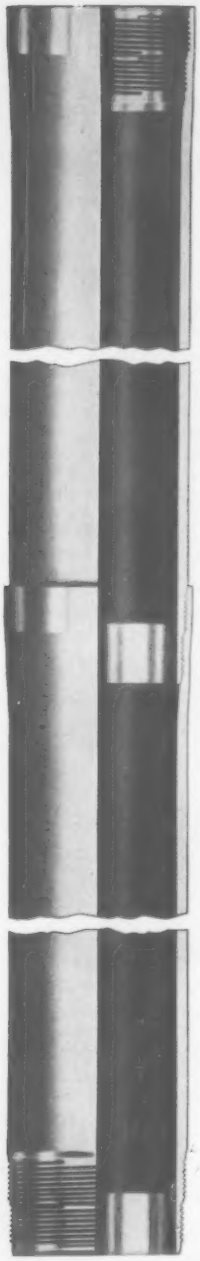


Fig. 12—Copper sulfate electrode used to make potential survey in vicinity of pipe line.

The electrode is placed on the surface of the earth over the pipe line, and is connected to one terminal of a high-resistance voltmeter. The other terminal of the meter is connected to the pipe line being tested. Fig. 13 shows in diagrammatic form how these tests are made at approximately 50-ft. intervals along an existing pipe line. The values obtained by reading the high resistance voltmeter are plotted along a chart like that shown in the upper half of Fig. 13. High points on the chart will be anode areas to lower points along the chart.



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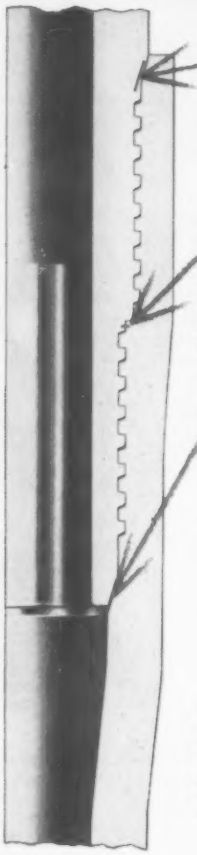

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	Feet	Feet	1000 Lbs.
5½–14# J-55	5,640	8,900	244
5½–15.5# J-55	6,860	9,380	288
5½–17# J-55	8,000	9,780	330
5½–17# N-80	10,470	11,140	376
5½–20# N-80	13,480	11,790	467
7–20# J-55	4,440	9,010	352
7–23# J-55	5,850	9,630	436
7–23# N-80	7,640	10,980	497
7–26# J-55	7,220	10,090	518
7–26# N-80	9,460	11,520	591
7–29# N-80	11,320	11,920	685

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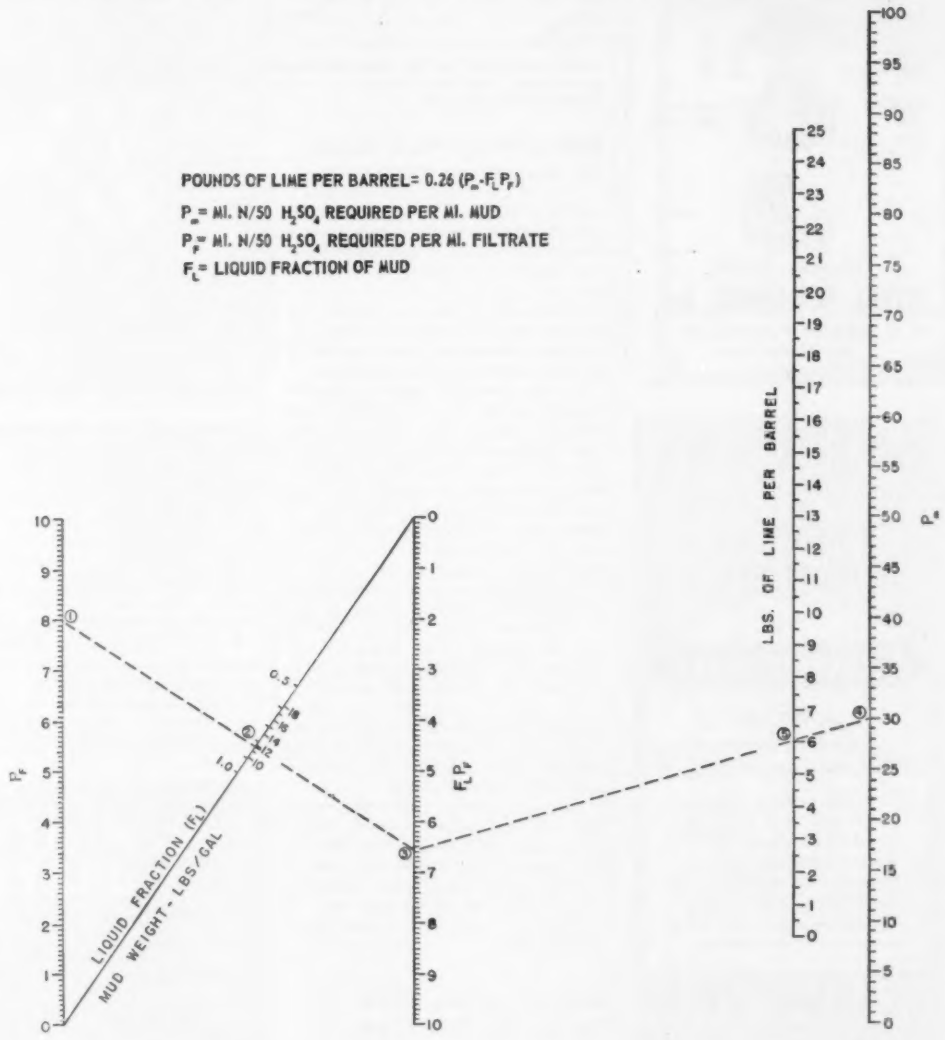
P_F = Ml. N/50 H_2SO_4 REQUIRED PER Ml. FILTRATE

F_L = LIQUID FRACTION OF MUD



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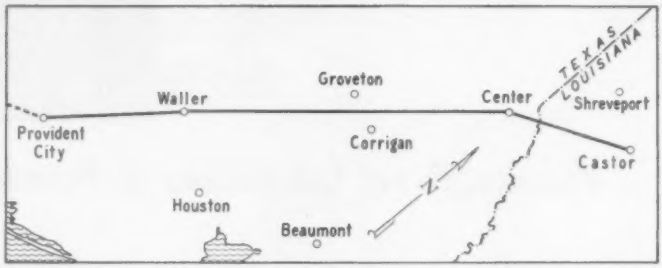


TEXAS EASTERN line, for which subcontracts have been let on four sections, traverses this general route. Authorized Wilcox trend system (dotted line at left) will connect with Texas Eastern at Provident City.

Right-of-Way Work Begins On New Texas Eastern Line

HOUSTON. — Clearing of right-of-way is under way for Texas Eastern Transmission Corp.'s new natural-gas-transmission line from Provident City, Tex., to Castor, La.

Prime contract for the 315-mile, 24-in. line is held by Brown & Root, Inc., Houston, which has sublet sections of the line to four other contractors.

Laying of the 80 miles of the line from Provident City to Waller, Tex., will be handled by Associated Pipe Line Contractors, Inc., Houston. Anderson Brothers Corp. will lay 80 miles from Waller to the vicinity of Corrigan, Tex.; Williams Brothers Co., 75 miles from Corrigan to Center, Tex.; and Trojan Construction Co., Inc., 80 miles from Center to Castor.

Ditching operations are scheduled to get under way late this month.

Permission to lay the $23,283,540 line was granted by the Federal Power Commission late in December *(The Oil and Gas Journal, December 29, 1952, page 112)*. It will carry about 140,000,000 cu. ft. of gas per day initially, with a future capacity of 350,000,000 cu. ft. possible with the addition of compressor stations.

At Castor, the new line will connect with Texas Eastern's existing "Little Inch" line. At Provident City, the line will connect with a new line soon to be built by Wilcox Trend Gathering System from Hagist Ranch field in McMullen County at a cost of about $10,500,000.

Gulf to Lay 8-In. Outlet For Portilla Field Crude

HOUSTON.—Gulf Oil Corp. has revealed plans to lay a 22-mile, 8-in. crude line from Portilla field in South Texas to Pontiac Refining Co.'s refinery at Corpus Christi.

The line will handle 10,000 to 12,000 bbl. of oil daily. It will cost more than $300,000 and will be completed by April 1, according to officials of Gulf's pipe-line department here.

Part of the oil will be taken by Pontiac Refining. The remainder will be shipped by barge or tanker to other places.

Algonquin Files for New Hearing of FPC Decision

BOSTON. — Algonquin Gas Transmission Co. has filed a petition with the U. S. Court of Appeals here for a rehearing of its case for a temporary certificate of necessity to complete its $45,000,000 natural-gas line from New Jersey to New England.

Two weeks ago, the court upheld a ruling by the Federal Power Commission that it did not have the authority to issue such a certificate to a company not already serving an area.

Algonquin contends in the petition that FPC and the court placed too limited a construction on the wording of the law governing issuance of certificates in time of emergency. If the law were viewed less rigidly, Algonquin's attorney said, it would result in an affirmation of the power of FPC to issue the certificate.

A.P.I. Publishes Standard On Field Welding Pipe Lines

WASHINGTON. — The American Petroleum Institute has announced the publication of a new standard for field welding of crude, products, and natural-gas-transmission lines.

The standard is designed to insure production of the highest quality of

welds obtainable on a commercial basis by skilled welders using approved procedures, materials, and equipment.

It was prepared by a formulating committee composed of representatives from the American Gas Association, National Manufacturers Association, Pipe Line Contractors Association, American Petroleum Institute, and other groups. The committee was assisted by engineers interested in design, construction, and operations of oil and gas lines.

Copies of the publication "A.P.I. Std. 1104, Tentative Standard for Field Welding of Pipe Lines," may be ordered for 50 cents from J. A. McNally, American Petroleum Institute, 50 West Fiftieth Street, New York 20.

Mid-Valley Trying New Type Of Public-Relations Program

LONGVIEW, Tex. — Mid-Valley Pipeline Co., owned by Standard Oil Co. (Ohio) and Sun Oil Co., is conducting a new type of public-relations program pointed at reaching all persons affected by the firm's operations.

So far selected company representatives have contacted personally 4,000 property owners and residents in 15 communities along the 1,000-mile route of the company's trunk line from here to Lima, Ohio.

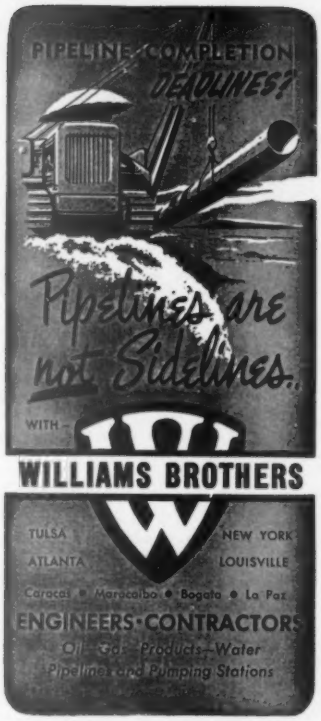
Mid-Valley's policies in regard to right-of-way maintenance, local employment practices, and purchasing are being explained.

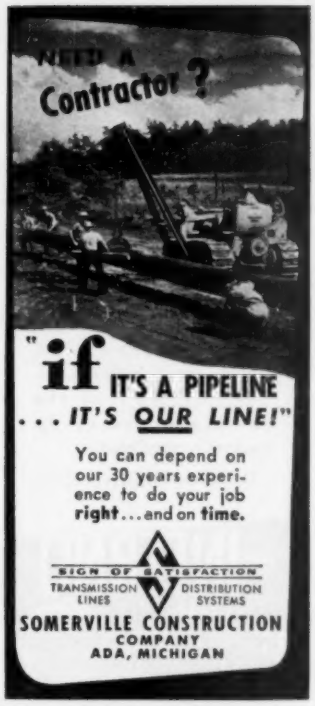
The company is trying something entirely new in the field—the distribution of farm calendars to property owners along the line giving the name of the nearest pump station and division office which should be called if the owner discovers a leak or a washout.

Pipe-Line Briefs

Interprovincial Pipe Line Co. is completing plans to let a contract for the construction of 130 miles of 24-in. pipe line from Regina, Sask., to the U. S.-Canadian border. This will loop an existing line. In listing this project in the pipe-line-construction tables of The Oil and Gas Journal for December 29, January 12, and January 26, it was incorrectly stated that the contract had been let to Anderson International, Ltd.

Cities Service Pipe Line Co. has awarded a contract to Associated Pipe Line Contractors, Inc., for construction of 64 miles of 20-in. crude pipe line fom Sour Lake, Tex., to Lake Charles, La. Clearing of right-of-way is going ahead.

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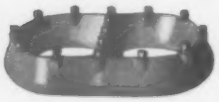

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Among the Drilling Contractors

New Drilling Record Set For Deep Elk City Wells

Helmerich & Payne, Inc., Tulsa, has set a new drilling-time record for the 10,000-ft. Elk City field by completing a well in 33 days from spudding date. This time was 2 days under the previous record, held by the same contractor, and 8 days under the average time required for completing wells in this field. Approximately 200 wells have been completed to date in the field.

The record was set on Shell Oil Co. 3-D Fender, completed at a total depth of 10,823 ft. Hole was completed from spudding to 10,000 ft. in 30⅓ drilling days. Two additional days were allowed for running casing and waiting on cement to set. Another three-fourths of a day's time was spent on fishing and shutdowns for repairs.

The rig on the record well was the company's No. 35, an Oilwell 96. Since this rig has been in operation in the field more than 2 years, the company attributes the reduction in drilling time mainly to the steadily increasing personnel efficiency. The rig on the company's previous record well was its No. 38, a National 80, which also had been in operation in the field for some time. The record well was drilled with three 12¼-in. and forty-eight 7⅞-in. rock bits.

Tool pusher on the rig was Wesley Reed. Drillers were Gene Burton, Guy Robinette, and E. L. Shelton.

Justiss-Mears Drilling Co., Jena, La., has moved a rig to a wildcat location 2 miles southwest of the one-well West Pool Lake field, in Catahoula Parish, Louisiana, where it will drill for Justiss-Mears Oil Co. and R. A. Campbell. The new test, 1 Link, in 29-8n-7e, is scheduled to go to approximately 6,000 ft. for a test through the Wilcox.

Southern Six Drilling Co., Opelousas, La., is starting a 9,500-ft. wildcat test for H. L. Hawkins at 1 Childs, in 55-7s-1e, 3 miles southwest of Eunice, Acadia Parish, Louisiana Gulf Coast.

Guy Mabee Drilling Co., Midland, Tex., is drilling on a new Ellenburger test for J. C. Barnes and Rowan & Hope in northern Nolan County, West Texas. It is a wildcat, 1 Aycock, located north of Lake Sweetwater, near Sweetwater, the county seat. This contractor also has another new wildcat test under way in Tom Greene County, also in West Texas, where it is drilling for Blackwood & Nichols. The latter test is 1-A Seals, with location in the T&NO Survey, 15 miles northeast of San Angelo.

Gulf Coast Drilling Co., Houston, has taken on a new offshore drilling job for Shell Oil Co. It will be a 12,750-ft. test in the Gulf of Mexico, off the coast of Terrebonne Parish, Louisiana, in State Tract 4,965.

Cooper-Herring Drilling Co., Tyler, Tex., has a rig working for Ben F. Whitaker on a wildcat location 3½ miles southwest of Wills Point, Van Zandt County, East Texas. The operation is designated as 1 Hamilton. Location is in the David Clapp Survey

Morgan Drilling Co., Oklahoma City, which recently completed a ¾-mile north extension producer for the active East Payson field, in Lincoln County, Oklahoma, is starting another long-extension test 1½ miles northwest of the field for Morgan & Pray. The new test, 1 Koos, SW NW SE 23-13n-4e, is projected to 4,200 ft.

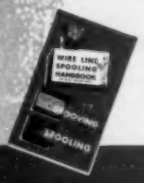
Big Chief Drilling Co., Oklahoma City, has the contract for a projected 15,500-ft. test which Shell Oil Co. is undertaking a mile south of the 10,000-ft. Elk City field, in Beckham County, western Oklahoma. The test is being carried as 1 Carter-Caughron, with location in the C SE NW 19-10n-21w.

Heasley & Crumpler Drilling Co., Houston, has contracted with Ranch Oil Co. of Dallas for a 7,700-ft. wildcat test, 1 Shadix, 10 miles southeast of Centerville, in Leon County, East Central Texas.

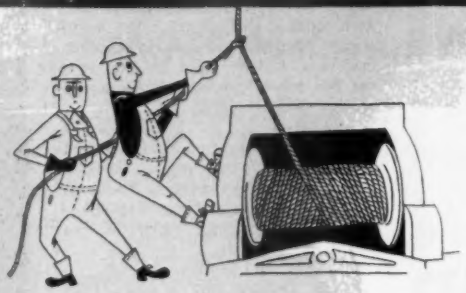
Grantham & King tools are being contracted by Cryer Drilling Co. and associates on a Nacatoch wildcat test they are starting at 1 Atlantic Crystal, NW NE SW 4-20n-13w, 1½ miles west of the Benton field, in Bossier Parish, northern Louisiana.

Circle Drilling Co., Lake Charles, La., contracting for Bates & Cornell of Lafayette, La., is starting a Wilcox test 1¼ miles north of Kemp Drilling Co.'s recently completed oil-discovery well at

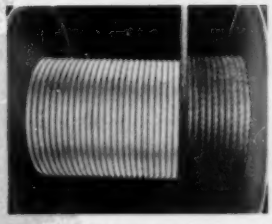
PAGES FROM THE LEBUS WIRE LINE SPOOLING HANDBOOK

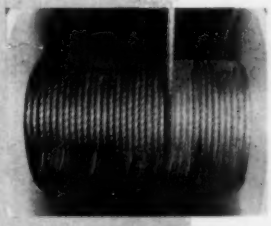


PYRAMID SPOOLING vs. HELICAL SPOOLING



The old original type of grooving used on hoisting drums is commonly referred to as "Helical Grooving." This helical or threaded type of grooved drum makes the wire line progress across the drum in a threaded manner as the drum is rotated for the hoisting operation. All additional or succeeding layers of line wrap onto the preceding layers in a reverse helical direction while progressing across the drum core. Therefore, it is impossible for the succeeding wraps to fit into the groove of the preceding wraps in a mechanically uniform pattern. For this reason, when a number of wraps are needed, the line slips over easily causing gaps, and CUTTING IN. This CUTTING IN IS A REGULAR SOURCE OF TROUBLE. An excessive amount of kickers and end fillers can be used on drum flanges to keep the line from slipping over and they will somewhat reduce CUTTING IN, but as the line reduces in diameter from constant use, this arrangement requires constant attention.





These two photos show the first and second layers of line being spooled on the parallel side of Lebus Grooved Drum. They further illustrate PROGRESSIVE GROOVING attained with LeBus Grooving.

The system of grooving and spooling wire line fully illustrated in the LeBus Wire Line Spooling Handbook, and known as the LeBus Grooving and Controlled Pyramid Spooling System* completely eliminates the 100% helical angle on which wire line has been spooled in the past and automatically creates Progressive Grooving for each succeeding layer of wraps. The LeBus System assures good spooling regardless of speed, plus elimination of much lost time.

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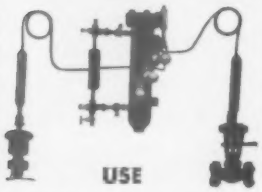

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Twisty Bayou, northern Avoyelles Parish, in Central Louisiana. The new operation is 1 Peterson, in 27-3n-5e. Contract is for 7,300 ft.

Trans-Tex Drilling Co., Longview, Tex., is drilling for Bracken Oil Co. at 1 Scottish Rite Hospital, in the S. Sheldon Survey, north of Woodlawn, in Harrison County, East Texas.

Don M. Rounds Drilling Co., Denver, is drilling on a contract with Anschutz Drilling Co. and Argo Oil Co. at a wildcat location 15 miles southwest of Merino, Morgan County, northeastern Colorado. Spot location is in the NE NE NE 6-5n-56w, on the operators' Williams lease.

Dixilyn Drilling Co., Fort Worth, is drilling for Gulf Oil Corp. at a wildcat location 9½ miles north of Crane, in Crane County, West Texas. The test, 1 Gulf-Stanolind-State "EH," is projected to 12,500 ft.

Clark Drilling Co., Wichita Falls, Tex., has a 7,000-ft. wildcat test under way for Gulf Oil Corp. at 1 Shamburger, 14 miles southeast of Paducah, in Cottle County, northern Texas.

Westlund Drilling Co., Sterling, Colo., is the contractor on a new Cretaceous-sand test which W. M. & A. P. Fuller are starting in the Pawnee Creek area, 11 miles west of Sterling, in Logan County, northeastern Colorado. Location is for 1 Tomkins, in the NE NE NW 33-8n-54w.

Miracle-Fifer Drilling Co., Denver, has contracted with Ryan Oil Co. for a Cretaceous-sand test, 1 Michaels, in the NE SE SW 31-12n-52w, 6 miles northeast of Armstrong, Logan County, northeastern Colorado.

ACTIVE ROTARY RIGS*

(United States and Western Canada)

Area—	Week ended 1-19-53	Change week ended 1-12-53	Change week ended 1-21-52
Gulf Coast	608	+ 1	— 20
N. & W. Tex.-N. M.	777	—22	—266
Ark.-N. La.-E. Tex.	139	+ 1	— 44
Oklahoma	329	+ 1	— 25
Kans.-S. Neb.	151	—11	— 11
Illinois-Eastern	89	— 8	+ 15
Rocky Mtn.	215	— 7	+ 50
Pacific Coast	179	— 5	+ 10
Total U. S.	2,487	—50	—291
Western Canada	165	— 3	— 18
Total	2,652	—53	—309

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States and the Rocky Mountains and western Canada areas are shown on pages 450 and 451.

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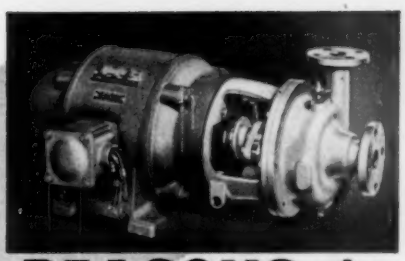

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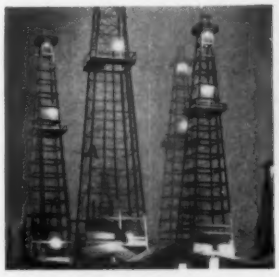

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REFINING

Northwestern Completing First Unit of Big Project

ST. PAUL PARK, Minn.—Northwestern Refining Co. has revealed that the first unit, a 5,000-bbl. catalytic cracker, of the company's $4,500,000 expansion program at its refinery here is nearing completion.

Elmer R. Erickson, executive vice president of Northwestern, said the entire program, which will increase capacity of the refinery 500 per cent, from 6,000 bbl. daily to 30,000 bbl. daily, will be completed this fall.

Northwestern, in addition to the cracker, is erecting twin 15,000-bbl. atmospheric distillation units, a 10,000-bbl. vacuum unit, and 5,000 bbl. daily of additional asphalt-producing equipment.

Danaho Preparing to Expand Refinery at Pettus, Tex.

PETTUS, Tex. — Danaho Refining Co. will start soon on an expansion program at its refinery here, raising crude-charge capacity of the plant from 4,500-bbl. daily to a new total of 9,500 bbl. daily.

Other major units in the project are a 3,500-bbl. catalytic cracking unit and a catalytic polymerization plant. Completion of the project is scheduled by 1954.

A.C.S. Group Sponsoring 10 Petrochemical Lectures

NEW YORK.—The North Jersey section of the American Chemical Society will sponsor a series of 10 lectures on petrochemicals during February, March, and April.

The lectures will be given at the Roosevelt School Auditorium, Rahway, N. J., on Tuesday evenings from 7:00 to 9:00 p.m.

The series includes: "The Scope and Growth of the Petrochemical Industry," Dr. R. L. Bateman, Carbide & Carbon Chemical Co., New York, February 3; "Aliphatic Chemicals—Olefin Derivatives," Dr. J. P. Cunningham, Shell Chemical Corp., New York, February 17; "Aliphatic Chemicals—Carbon Monoxide Derivatives," Dr. Milton Orchin, U. S. Bureau of Mines, Pittsburgh, February 24; "Aliphatic Chemicals—Natural Gas Oxidation," Dr. O. V. Luke, Celanese Corp. of America, Clarkwood, Tex., March 3; "Aromatic Chemicals from Petroleum," D. S. Maisel, Standard Oil Development Co., Linden, N. J., March 10.

"Detergents from Petroleum," L. H. Flett, Allied Chemical & Dye Corp., New York, and Dr. R. L. Wakeman, Quaker Chemical Products Corp., Conshohocken, Pa., March 17; "Hydrocarbon Monomers for Production of Polymers," S. E. Jaros, Standard Oil Development Co., Linden, N. J., March 24; "Nonhydrocarbon Monomers for Production of Polymers," Dr. C. E. Schildknecht, consulting chemist, Montclair, N. J., March 31; and "Nitrogen and Sulfur Derivatives from Petroleum," Dr. J. E. Mahan, Phillips Petroleum Co., Bartlesville, Okla.

Fees for the series are: $8.50 for A.C.S. members, $15.00 for nonmembers, and $5.00 for students. Enrollment forms may be obtained from Robert E. Jones, Merck & Co., Inc., Research and Development, Rahway, N. J.

Aurora Contracts for New Platformer at Elsie Plant

DETROIT. — Aurora Gasoline Co. has awarded contract for construction of a new 1,500-bbl. per day Platforming unit at its Elsie, Mich., refinery to Procon, Inc., Des Plaines.

Aurora's Elsie plant has a crude-

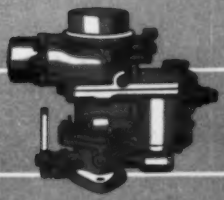
Facilities Near Completion

Feed-preparation facilities for the No. 4 T.C.C. unit at Magnolia Petroleum Co.'s Beaumont, Tex., refinery are now past 80 per cent complete. They will be placed in service during a forthcoming turnaround. Lummus Co. is general contractor.

ENSIGN

Model "Kg1"
Gas Carburetor

Model "Kgn1"
Combination Carburetor



Model "Cg"
Combination Carburetor

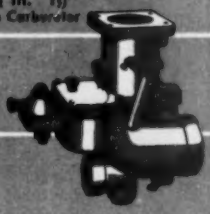
Model "F"
Regulator

Model 2½ in. "Tg"
Combination Carburetor

Model "B"
1 in. Regulator

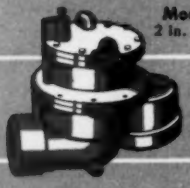
Model "G1"
Gas Carburetor

Number 6257
Liquid LP-Gas Filter



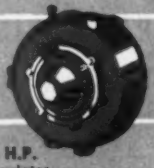
Model "R" 125 H.P.
LPG Vaporizer & Regulator

Model "A"
Gas Carburetor

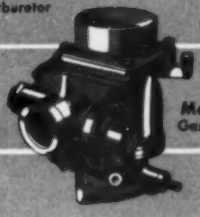


Model "B"
2 in. Regulator

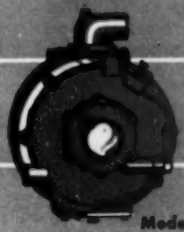
Model ¾ in. "Tg"
Combination Carburetor



Model "W" 55 H.P.
LPG Vaporizer & Regulator



Model "Xg"
Gas Carburetor



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charge capacity of 5,700 bbl. daily. At present, it has no thermal or catalytic operations.

The company has been operating a larger 4,500-bbl. Platformer at its Detroit refinery since September 1951. The Detroit plant has a crude-charge capacity of 33,000 bbl. daily. Thermal operations total 10,500 bbl., including visbreaking, reforming, and polymer production capacity. Catalytic cracking capacity is 13,500 bbl. daily.

Shell Postpones Expansion Of Houston Lube Facilities

HOUSTON.—Shell Oil Co. has postponed indefinitely its plans for an $8,500,000 addition to lube-manufacturing facilities at its refinery here.

Shell officials said the change in plans was due principally to the recent overabundance of lube oils. When the company first planned the project, and applied for certificates of necessity, there was a shortage of lubes.

The Defense Production Administration recently approved Shell's application for accelerated amortization in two certificates, one for 65 per cent of $5,650,000 and one for 45 per cent of $2,850,000.

Refining Briefs

United Refining Co. will commence construction shortly of a 2,500-bbl. catalytic reforming unit at its Warren, Pa., refinery. Licenser of the Catformer unit is Atlantic Refining Co. Blaw-Knox Construction Co. of Tulsa will design and build the unit. Completion is scheduled for August 1953.

Cities Service Oil Co. (Pa.) has revealed that it is planning to install a 5,600-bbl. vacuum unit at its Linden, N. J., refinery. The Linden plant, a topping operation, has a current crude-oil rating of 15,000 bbl. per stream day.

American Liberty Oil Co. has started construction of a new catalytic cracking and catalytic polymerization plant at its Mt. Pleasant, Tex., refinery. The new cracker is rated at 5,120 bbl. per stream day at 75 per cent conversion.

Republic Oil Refining Co. has announced that it will complete construction of a new 5,000-bbl. Platforming unit at its Texas City, Tex., refinery early this fall. Republic's 40,000-bbl. refinery is equipped with both thermal and cat cracking facilities. Major processing units also include a 1,000-bbl. catalytic polymerization unit.

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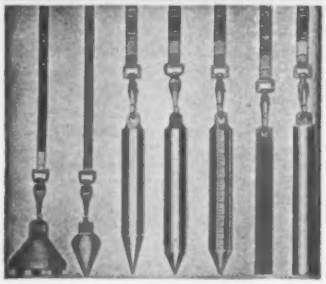
For Starrett Steel Tapes



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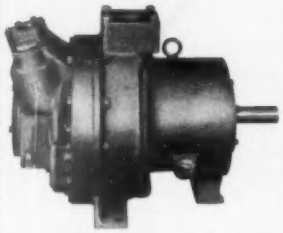

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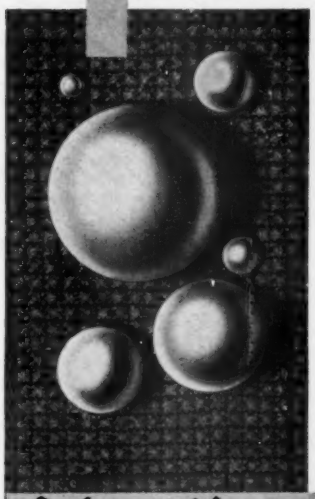

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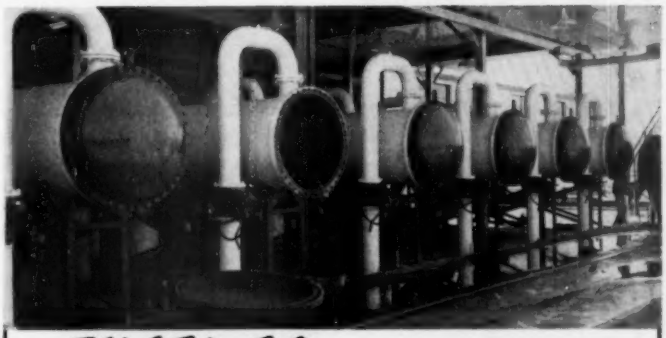

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NATURAL GAS

Applications for Rate Hikes Gain 65 Per cent in 1952

WASHINGTON.—The Federal Power Commission reported last week that it acted upon applications by 30 companies in 1952 for rate increases totaling $148,953,000.

The dollar figure was up 65 per cent from the total acted upon in 1951. Chairman Thomas C. Buchanan said FPC suspended $148,101,000 of the total last year and accepted the remaining $852,000.

Of the suspended filings, $26,463,000 were allowed to become effective, $7,750,000 were disallowed, and the companies were permitted to withdraw $4,700,000. Of the remaining $109,188,000, more than $100,600,000 were still suspended, and $8,586,000 became effective under bond pending final disposition by the commission.

Price Fixing Won't Conserve Kansas Gas, Professor Says

TOPEKA, Kans.—A university economics professor last week told the Kansas Corporation Commission that price fixing is not the way to conserve gas in Hugoton field in the southwestern part of the state.

The professor, Dudley E. Pegrum, testified for 147 Kansas towns and cities which are opposing a proposed increase in the minimum well-head price of gas in the field to 14 cents per M.c.f. at 16.4-psi. pressure base from the present 8 cents. The price hike is sought by the Southwestern Kansas Royalty Owners Association.

Pegrum said any increase in price will increase production and termed raising prices as "gas monopoly price fixing." He suggested limitations on types of gas use or limitations of production instead.

Bureau of Mines Publishes Underground-Storage Report

WASHINGTON. — Underground-storage capacity in the Appalachian region, comprising more than two-thirds of all fields used for storing natural gas in the United States, now stands at 526 billion cubic feet.

There are 101 operating underground-storage reservoirs in the area, the Bureau of Mines reports in a survey released last week.

The report, prepared as a general information circular by two bureau petroleum engineers, Henry P. Wheeler, Jr., Washington, and William E. Eckard, Franklin, Pa., discusses the factors involved in selecting and developing storage fields.

It takes into account the coexistence of coal mines and natural-gas storage in the Appalachian region and stresses the need for close cooperation between the two to achieve safe operation.

Sales Gain in November

WASHINGTON.—Sales of natural gas to ultimate consumers during November last year totaled 4,340 million therms to register a 10.7 per cent increase over sales during the same month in 1951.

The American Gas Association in its regular monthly report said sales during the 12 months ended November 30 were 48,202 million therms, up 8.5 per cent from sales in the like period in 1951.

Natural Gasoline

First Well Spudded for New Propane Storage Reservoir

HUTCHINSON, Kans.—Cities Service Oil Co. last week spudded the first of four shallow wells a mile west of here with which it will wash out a new underground-storage reservoir for propane.

A cavity capable of storing 1,000,000 gal. will be washed out of a salt formation by each of the four wells. The project thus will have a total capacity of about 4,000,000 gal.

Propane will be shipped to the storage project from nearby natural-gasoline plants by truck and from other Mid-Continent plants by tank car. Some above-ground storage and rail and truck loading and unloading facilities also will be built.

Brine from the leaching operations will be piped to Morton Salt Co.'s plant in the vicinity.

Phillips Submits Plans for Upton County L.P.G. Cavity

AUSTIN.—Phillips Petroleum Co., Bartlesville, Okla., has applied to the Texas Railroad Commission here for permission to store natural gasoline, butane, and propane in a 100,000-bbl. cavity which it would leach out in Section 46, Upton County, Texas.

Carl W. Jones, Phillips attorney, also asked that the company be permitted to create additional cavities nearby if the need arises.

Phillips plans to drill a storage well into a salt formation which it expects to encounter from 1,330 to 2,050 ft. Salt water from the leaching process would be filtered and disposed of through a 900-ft. disposal well into the salt water-bearing Santa Rosa formation.

Products for storage would be supplied by Plymouth Oil & Gas Co.'s Benedum plant and Phillips' Spraberry plant in Tex Harvey field. Phillips bought a one-half interest in the Benedum plant in November 1951 and contracted to buy all liquid products.

Atlantic to Build New Plant In Denton Field, Lea County

LOVINGTON, N. M.—Atlantic Refining Co., Dallas, has announced plans for construction of a community natural-gasoline plant in Denton field about 8 miles northeast of here in Lea County.

Atlantic will be operator of the plant. Ownership will be divided among 26 companies and individuals. Capacity of the plant will be 25,000 M.c.f. of gas per day. It will produce propane, butane, and natural gasoline.

No contracts have been let to date, but work is expected to start as soon as materials are available. Completion is scheduled for early 1954.

Tennessee Production to Build Plant Near Agua Dulce

HOUSTON. — A new $2,000,000 natural-gasoline plant is planned near Agua Dulce, Nueces County, South Texas, by Tennessee Production Co.

The plant will be located on Tennessee Gas Transmission Co.'s pipe line and will have a capacity to process 100 million cubic feet of pipe-line gas per day, according to Gardiner Symonds, president of T.G.T., which owns about 50 per cent of the production company's common stock.

Speaking before the Society of Security Analysts in New York, Symonds said design of the plant calls for the recovery of 70,000 gal. per day of natural gasoline and L.P.G. Upon its completion, scheduled for November, the plant will raise Tennessee Production's gross output of natural gasoline and L.P.G. to approximately 140,000 gals. daily.

Symonds estimated the company's reserves to be approximately 170 billion cubic feet of natural gas and 26 million barrels of liquids, including those to be recovered in the plants.

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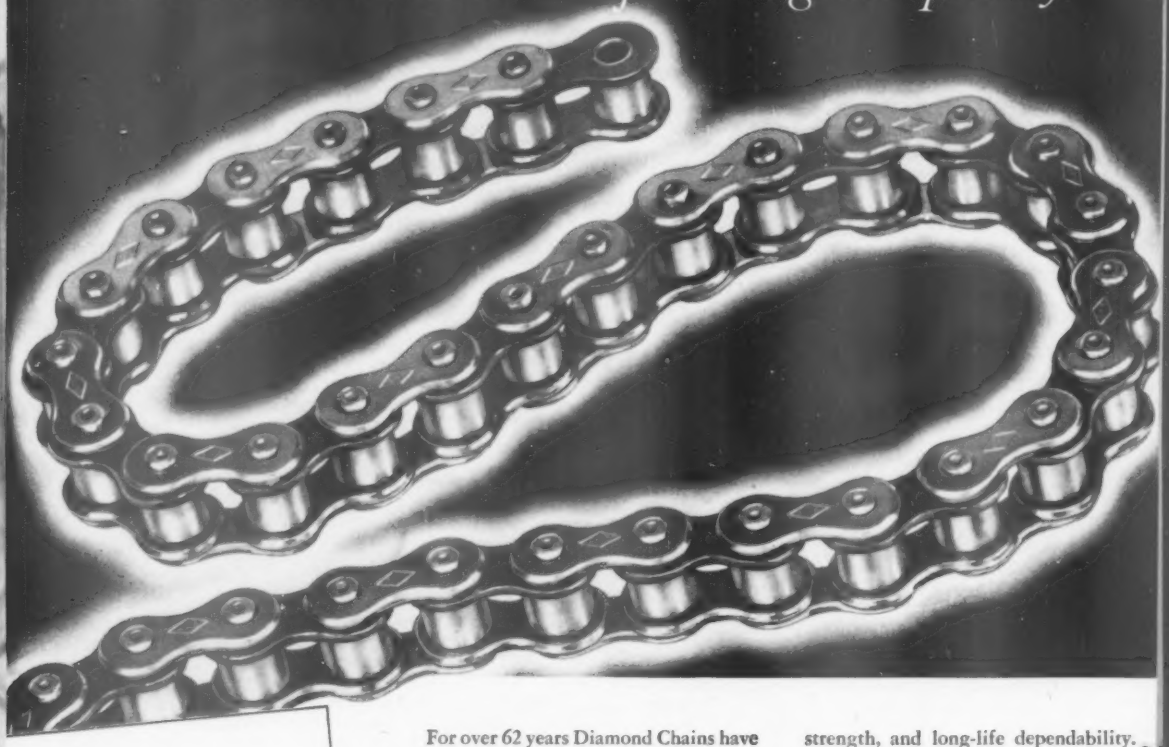

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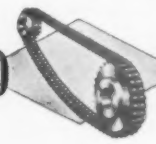
DIAMOND  **ROLLER CHAINS**

Williston Basin's Oil Fields

THE number of discoveries in the Williston basin is piling up, but proof of the ultimate significance of most of these discoveries is still wanting. Only on the Nesson anticline at Beaver-Tioga and on the Poplar anticline at East Poplar has development drilling proved sizable fields.

The sketch showing the Williston basin fields today is a far cry from that of just 2 years ago when this page carried a map of the heart of the Williston basin. That map showed a single drilling wildcat: Amerada Petroleum Corp. 1 Clarence Iverson. That wildcat was drilling below 11,500 ft. at the time and, though no one knew it, had already penetrated a 100-million-barrel oil field.

Just a little less than 2 years ago there came word that a southwestern Manitoba wildcat had discovered oil at 2,340 ft. That Manitoba discovery, though small, was looked upon as being very significant for the future development of the edges of the big, unknown Williston basin. The past year's interest in that eastern area might have come sooner had attention not been directed forcibly to the west by Amerada's big well in the heart of the Williston basin and then several strikes in rapid succession on to the west in eastern Montana.

However, when it became accepted that not every wildcat drilled in the basin was going to find a big oil field and not every development well was going to make a big producer, attention began to return to the areas to the east where objectives were shallower and dry-hole costs were less. Meanwhile Daly, the southwestern Manitoba pool, had been expanding. Today that pool is producing about 800 bbl. daily from 30 wells. Four other Mississippian discoveries have been made in the area.

Socony-Vacuum Exploration Co. et al 1 Ratcliffe was Saskatchewan's first discovery within acceptable limits of the Williston basin. This wildcat was completed in November 1952. On a 9-hour swab test it made 264 bbl. of fluid, about 50-50 oil and formation

water, from Mississippian rocks at about 6,400 ft. In December, Imperial Oil, Ltd., and Tide Water Associated Oil Co. opened a Cretaceous-Jurassic field at Wapella where a third small pumping well has been completed recently.

About halfway between the Ratcliffe and Wapella discoveries, Tide Water, as operator for a group of companies, has an indicated discovery that gives promise of being Saskatchewan's best to date. The well, 1 Forget Crown, flowed clean, 29.5°-gravity oil for 10 minutes at an estimated rate of 150 bbl. per hour from the Mississippian (Madison?) at 3,886-95 ft. Drill-stem tests of deeper intervals to 3,920 ft. yielded salt water as well as oil, indicating that the pay zone is probably somewhere between 20 and 30 ft. thick.

In Bottineau County, North Dakota, Zack Brooks-Crawford Smith's discovery in the unconformity zone between the truncated Mississippian-Charles and the basal Mesozoic formation at 3,352-85 ft., pumped oil at the rate of 8½ bbl. per day on test. This indicated discovery is but one of four active wildcats in four adjacent Bottineau County townships which have had shows of oil in the unconformity zone. Though interest is extremely high in this area, there is still no reason to believe that any of the tests will make a big producer.

Structurally the eastern area offers an ideal setup for regional porosity wedgeouts through the basin's entire pre-Cretaceous section. Wildcats have proved that some oil is present in this portion of the basin, but more wells of the apparent calibre of 1 Forget are needed if interest in the area is to be kept alive. *Philip C. Ingalls.*

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

MONTANA . . . Sun Oil Co. and Phillips Petroleum Co. cored dense lime with some shows from 9,614-72 ft. in 1 Dynneson, C SW NE 32-24n-58e, Richland County. Drill-stem test of the interval 9,580-9,672 ft. recovered only 410 ft. of slightly oil and gas-cut salt water in 4 hours.

SASKATCHEWAN . . . Tide Water Associated Oil Co. is preparing to test present total depth of 3,920 ft. at 1 Forget, LSD 2, 11-9n-7w2, in Central Saskatchewan. The well flowed at the rate of 150 bbl. of 29.5°-gravity oil per hour on test of the zone 3,886-95 ft.

NORTH DAKOTA . . . Amerada Petroleum Corp. recovered 174 ft. of heavily oil and gas-cut mud, 232 ft. of fluid, 65 per cent oil, 180 ft. of heavily gas-cut salt water on test of the interval 8,367-8,414 ft. at 1 Clifford Rice, C NE NW 23-158n-94w, 3-mile east extension to Tioga field.

WEST TEXAS . . . Magutex field of Andrews County received a long east extension and confirmation well in the Devonian at Humble Oil & Refining Co. 1-Q University in SE SW Section 15.

North-Central Texas

Grayson Wildcat Will Make Completion Attempt

WICHITA FALLS.—L. O. McMillan 1 Suddath Bros., Grayson County wildcat northwest of Sandusky and a west outpost test to McMillan Oil Creek field, perforated at intervals in the Pennsylvanian from 6,604-64 ft. for completion attempt. The well had failed to find production in the Oil Creek section in drilling to 8,781 ft., but swabbed 5 bbl. of oil an hour from the shallower pay.

Howell, Holloway & Howell have announced location for a 6,000-ft. wildcat to be drilled in the J. Browning Survey, A-97, 2 miles southwest of Whitesboro. The test will be carried as 1 S. F. Earl.

Coleman County had prospects of a new discovery, plus new locations for exploratory tests. Coronet Oil Co. 1-37 Morris, wildcat 6 miles northeast of Silver Valley and 3 miles northwest of nearest production, was testing in Morris sand. On first 35-minute drill-stem test from 2,555-67 ft., the well flowed oil in 23 minutes at an estimated rate of 400 bbl. daily. Recovery in the pipe included mud cut heavily with oil and gas, but no water. Projected depth was 4,200 ft.

New work included Hack Drilling Co. et al 1 R. M. Freeman, to be a 4,000-ft. test 4 miles south of Novice in Section 6, W. G. Strickland Survey. Bay Petroleum Co. 2 J. L. Keese was scheduled as a 3,150-ft. test 2 miles northwest of Valera in Section 56, Burnet CSL Survey. The same company's 1 Millie Popnoe, 3,850-ft. test, was located in 27-2-T&NO, 1 mile west of production and 2 miles southwest of Novice.

New work in Montague County included Carroll E. Sherman and P. C. Bundy 1 Arch Durham, Section 45, MEP&P Survey, 2½ miles northeast of Bonita. Projected depth was 4,000 ft.

Humble Oil & Refining Co. has scheduled a 6,000-ft. wildcat for west-central Taylor County; to be drilled as 1 H. Wiley Norwood in 296-64-H&TC. It will explore the Ellenburger.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Archer County: Morgan Bros. 1-C J. H. Turbeville, R. Carson Sur., A-106, TD 1,289 ft., elev. 1,091 ft., pay 1,263 ft., IP pumped 18 bbl. oil.

Clay County: Fain & McGaha 3-B Annie T. Morris, 5-A239-HT&B, TD 4,865 ft., Vogtsberger sand pay 4,755 ft., IP pumped 122 bbl. 40°-gravity oil, GOR 420 cu. ft.

Jack County: L. T. Burns 6 J. T. Pickens, Rebecca Parker Sur., A-461, TD 3,888 ft., pay 3,885 ft., IP pumped 79.5 bbl. 41°-gravity oil, GOR 470 cu. ft.

Russell Maguire 1-F Cherryhomes, F. Wampler Sur., A-2,180, TD 5,655 ft., gas pay 5,033-46 ft., IP 4,500,000 cu. ft.

McMahan-Bullington Drilling Co. 1-S W. B. Bryant, H. H. Fuquay Sur., TD 409 ft., pay sand 388 ft., IP pumped 13 bbl. 36°-gravity oil.

Walter Plemmons Production Co. 1 G. A. Pippin, BS&F Sur. 1, A-77, TD 3,050 ft., Strawn sand pay 3,030 ft., IP 420 bbl. 42°-gravity oil, ½-in. choke, TP 65 psi., GOR 375 cu. ft.

Taylor County: Roark, Hooker and V. C. Perini Jr. 1 Leslie N. Brown, Jose Gabo Sur., TD 3,357 ft., pay 3,254 ft., IP 120 bbl. 32°-gravity oil, 16/64-in. choke, TP 50 psi., GOR 100 cu. ft.

Mountray Moore Drilling Co. 1 Henry Sayles, 63-5-T&P, TD 4,142 ft., elev. 2,095 ft., Palo Pinto 4,122 ft., perforated 4,114-26 ft., IP 131 bbl. 35°-gravity oil, 12/64-in. choke, TP 50 psi., GOR 100 cu. ft.

Young County: Burk Royalty Co. 2 Gore, TE&L Sur. 728, TD 2,574 ft., pay 2,568 ft., IP pumped 58 bbl. 40°-gravity oil, GOR 650 cu. ft.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: I. Dee Campbell 1 L. K. Hyer, 2,417-A594-TE&L, dry, TD 1,383 ft.

Darden, Lomax & Maxwell 1 John Davis, Blk. 4, J. McCraney Sur., dry, TD 1,131 ft.

Thornton Lomax Jr. 1 P. J. Kelly, Blk. 68, J. W. Harris Subd., dry, TD 1,340 ft.

Russell Maguire 1 Zilbman, Lot 74, Blk. 3, Clark & Plumb, dry, TD 4,715 ft.

Baylor County: L & M Co. 2 Mrs. W. B. Wise, 6-B-HT&B, dry, TD 4,802 ft.

Megargel Drilling Co. 1 J. A. Young, Sec. 2,426, TE&L Sur., dry, TD 1,422 ft.

Reno Oil Co. et al 1-D Cowan, Sec. 102, T&NO Sur., dry, TD 2,769 ft., elev. 1,210 ft., reef 2,602 ft.

Callahan County: R. W. Brown 1 E. W. Riggs, Blk. 217, Victoria CSL, dry, TD 4,104 ft., elev. estimated 1,800 ft., Ellenburger 4,020 ft.

Coleman County: Gilchrist Drilling Co. 1 Elgean Shield, Sec. 64, G. W. Mahoney Sur., dry, TD 2,200 ft.

Guy Mabee Drilling Co. 1 E. O. Herring, Sec. 73, H. M. Childress Sur., dry, TD 3,703 ft.

Horace White 1 M. W. Sealy, Sec. 318, Wm. Sheperd Sur., dry, TD 3,791 ft.

Eastland County: Rose & Day and Fred Birdsong 1 J. V. Harbin, 15-2-H&TC, dry, TD 1,260 ft.

W. F. Newton 1 J. R. Higgins, Sec. 43, McLennan CSL, dry, TD 1,485 ft.

Fisher County: Rowan & Hope 1 T. C. Elliott, 23-306-El Paso CSL, dry, TD 6,521 ft., elev. 2,011 ft., Canyon lime 4,700 ft.

Grayson County: Erle P. Halliburton 1 C. D. Aycock, Edward Velasco Sur., A-1,286, dry, TD 5,125 ft., elev. 733 ft., Ellenburger 4,896 ft.

Haskell County: K & H Operating Co. 1 C. A. Frierson, Richie Sur., A-119, dry, TD 5,308 ft., elev. 1,300 ft., Caddo 5,300 ft., lower Strawn sand 4,913 ft.

Jones County: Belcher & Harding 1 Mrs. Bettie Burleson, 208-10-J. W. McKissick Sur., dry, TD 3,506 ft., elev. 1,754 ft., Saddle Creek 2,550 ft., Hope 2,810 ft.

A. P. Carr 1 Davis Est., Lot 5, E. M. Smith Sur., dry, TD 1,810 ft.

Carl Hovgard 1 Asa Holt Est., 48-16-T&P, dry, TD 2,448 ft.

Nelson Bunker Hunt 1 J. M. Winter, 39-18-T&P, dry, TD 4,328 ft., elev. 1,848 ft., reef 4,208 ft.

Perini, Crawford and Hubbard 1 J. E. Lynn, Sec. 42, BBB&C Sur., dry, TD 5,217 ft.

Montague County: W. T. Waggoner Est. 1 W. W. Bell, SA&MG Sur., A-703, dry, TD 6,665 ft., elev. 1,072 ft., conglomerate 6,413 ft.

Palo Pinto County: Bruce-Connally 1 M. B. Costello, R. R. Williams Sur., A-896, dry, TD 2,455 ft.

Trumter Petroleum Corp. 2 J. E. Bankhead, A. Bradley Sur., A-34, dry, TD 1,679 ft.

Shackelford County: M. A. Rabinowitz Trust 1 R. G. Murrie, Sec. 40, LAL Sur., dry, TD 3,005 ft., elev. 1,423 ft., Palo Pinto 2,112 ft., Strawn lime 2,620 ft.

Stephens County: C. W. Boyd 1 Eddleman, 27-6-T&P, dry, TD 2,101 ft.

Delta Oil Co. 1-C Bernie McCrea, Sec. 371, SPRR Sur., dry, TD 4,211 ft., Caddo 3,611 ft., Ellenburger 4,050 ft.

Taylor County: Miami Operating Co. 1 J. Bowyer, Sec. 19, LAL Sur., dry, TD 4,737 ft., elev. 1,826 ft., Caddo 4,452 ft., Ellenburger 4,680 ft.

Cities Service Oil Co., 182-1 Swenson, 182-A992-BBB&C, dry, TD 5,675 ft., elev. 1,509 ft., Caddo 4,797 ft., Mississippian 5,228 ft., Ellenburger 5,575 ft.

Wichita County: Cullum Bros. 1 Jackson, Sec. 9, Blk. 4, A-417, Denton CSL, dry, TD 1,660 ft.

Neeld & Hood Drilling Co. 1 J. Newton Huff, C. Roberts Sur., A-540, dry, TD 1,945 ft.

Young County: W. F. Bockhoff Trustee 1 I. G. Roach, Sec. 196, TE&L Sur., dry, TD 1,060 ft.

South Louisiana

New Oil Field Being Opened In Calcasieu

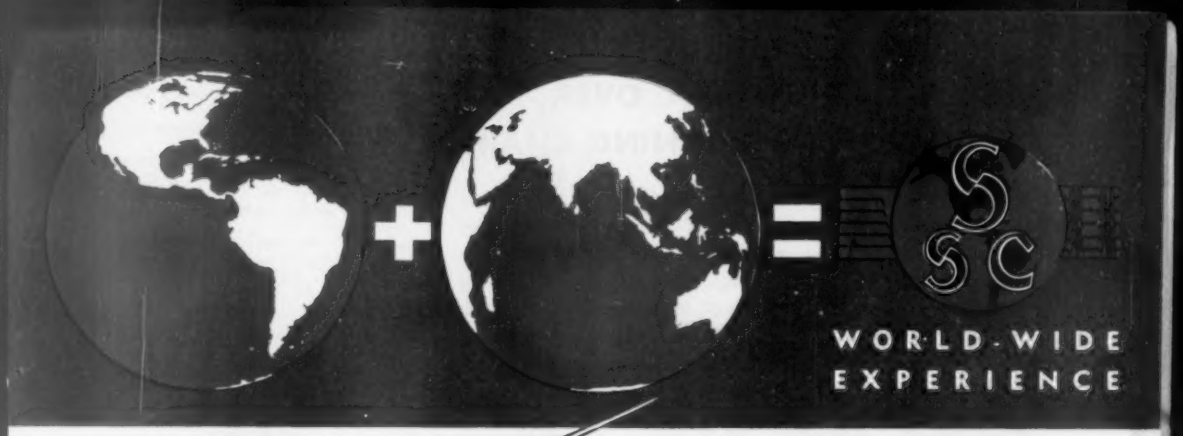
NEW ORLEANS. — McCauley and McCauley of Houston are opening a new oil field almost a mile northeast of the Bayou Choupique area in Calcasieu Parish at the 1 W. Sam Vincent, located in Section 16-11s-10w. Test was drilled to 9,515 ft. Pipe was cemented to 8,750 ft. and perforated 8,629-35 ft. Well flowed oil to pits under 1,100 psi. tubing pressure, no gage reported, nor check made on the gravity or ratio. Operators are now erecting a tank battery and will allow the prospective discovery to clean up before running a potential.

Richardson & Bass, Louisiana, have drilled the 1 Crowell Land and Mineral Co. to total depth of 13,000 ft., and landed a 5-in. liner at 10,640 ft. for completion attempts. This is a Rapides Parish venture located in Section 20-1s-3w, about 6½ miles southwest of Glenmora, La. Well was cored in this interval below and above the casing point; however, any possible shows have not been reported.

Ted Weiner is still testing his Wylie, a wildcat on the Southeast Gibson Prospect of Terrebonne Parish, allowing the test to flow gas-condensate from a 1-ft. pay section. It spots in Section 84-17s-16e. Well was drilled to a total depth of 10,612 ft., pipe was cemented to 10,600 ft., perforated from 10,568-569 ft. and drill stem tested. On ⅛-in. chokes, well developed 3,800 psi. pressure, making gas-condensate, no gage reported. It is likely that operator will test in a sand encountered just below 9,600 ft., reportedly the better of 4 separate sands logged to aggregate 55 ft. net pay in the well, before running any potential.

Coring point is near 12,265 ft. at Texas Pacific Coal and Oil Co. 1 Day, wildcat in St. Helena Parish, 6 miles northwest of Greensburg and making more hole. A core was cut at 12,060-160 ft. recovering 44 ft. of limey shale, no shows of oil or gas. This formation was upper Tuscaloosa. The test was also running 76 ft. high to Magnolia 1 Davis dry hole, which is a few miles to the southeast, this marker picked on top of the Wilcox at 6,716 ft.

Pan American Production Co. completed the 7 Miami Corp. in South Pecan Lake field of Cameron Parish, opening a new gas pay for that multi-pay field. Located in Section 8-15s-3w, well was drilled to 14,300 ft., tested in deep sands, found very little encouragement, then plugged back and completed from perforations 10,710 to 10,726 ft. Flow was 23 bbl. of condensate, 46.2°-gravity, 2,120,000 cu. ft. of gas per day on 10/64-in.



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says

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Doodlebug, S. S. C.

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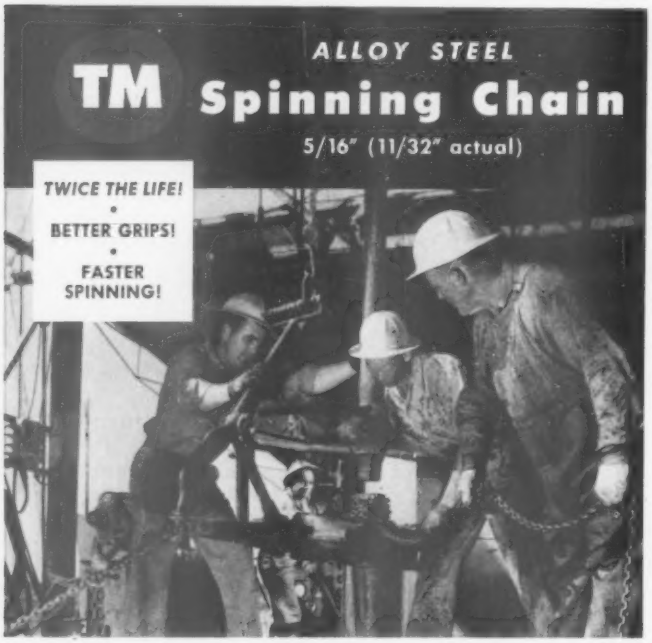
TM Alloy Steel Spinning Chain is the answer to driller's demands for a better product on today's deeper holes. This is proved by its widespread popularity throughout the oil fields. Taylor's 5/16" (11/32" actual), special analysis steel and unique chain-making methods assure spinning chain that has greater life—greater strength and greater safety than hi-test types. It's extremely resistant to shock, grain growth, abrasion and cold working at all temperatures. The short, stubby links assure more flexibility and better grips for faster spinning! Taylor also manufactures TM Alloy Steel Boomer Chains. Spinning and Boomer Chains are available in hi-test types as well. Start taking advantage of the savings to be derived from these famous chains right away. Contact your nearest oil well supply store now! S. G. Taylor Chain Company, Hammond, Indiana.



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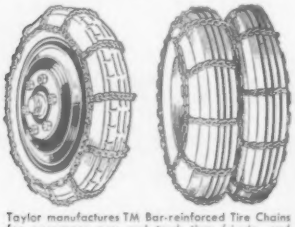

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choke, tubing pressure 3,900 psi., gas condensate ratio at 91,000-1.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Assumption Parish: Texas Gulf Producing Co. 1 Est. Militus Babin, Sec. 40-12s-13e, TD 10,995 ft., IPF 292 bbl. of oil per day on 10/64-in. choke, 36.5°-gravity oil, gas-oil ratio 1,054-1.

Cameron Parish: Pan American Producing Co. 7 Miami Corp., Sec. 8-15s-3w, TD 14,300 ft., IPF 23 bbl. of oil plus 2,120,000 cu. ft. of gas per day on 10/64-in. choke, gas-oil ratio 91,000-1, 46.2°-gravity oil.

St. Martin Parish: The Ohio Oil Co. 1 N. H. Breaux Unit 2, Sec. 35-14s-11e, TD 10,062 ft., IPF 48 bbl. of oil per day on 8/64-in. choke plus 1,085,120 cu. ft. of gas, 46.9°-gravity oil, oil-gas ratio 24,711-1.

Plaquemines Parish: Woods Oil & Gas Co. 2 Dr. B. R. Slater, Sec. 6-18s-27e, TD 11,617 ft., PT 347 bbl. of oil in 24 hours on 9/64-in. choke, 33°-gravity oil gas-oil ratio 700-1.

SOUTH LOUISIANA WILDCAT FAILURES

Acadia Parish: Sun Oil Co. 1 E. Pousson, Sec. 18-9s-1w, dry, TD 11,772 ft.

Calcasieu Parish: M. P. O'Meara 1 M. P. O'Meara Min., Sec. 21-10s-11w, TD 6,708 ft., dry.

Richardson & Bass 1 Ferdinand Heyd, Jr., Sec. 10-9s-7w, dry, TD 13,503 ft.

Evangeline Parish: H. C. Spoor, Jr. 1 Onezime Vedrine, Sec. 14-5s-1w, dry, TD 8,402 ft.

Jeff Davis Parish: Bateman Drilling Co. & Wm. Helis Est. 1 A. Hollins, Sec. 34-7s-5w, dry, TD 8,028 ft.

St. James Parish: Coltexo Corp. 1 J. W. Waguespack et al, Sec. 32-12s-17e, dry, TD 10,828 ft.

The Texas Co. 1 "Wehre Unit 1," Sec. 13-13s-17e, dry, TD 11,000 ft.

Eastern Texas

Paluxy Discovery in Smith County Finaled

DALLAS.—Sun Oil Co. 1 Hitts Lake, Paluxy discovery or extension southwest of Sand Flat in Smith County, has been completed for a flowing potential of 230 bbl. of oil a day. The flow was through ⅛-in. choke on perforations at 7,174-7,242 ft. The producing zone was reported as being below the water table in the Sand Flat field.

The new area was already in line for development drilling. Sun will drill 2 Hitts Lake as a south offset, in the John Lane Survey, and R. S. Peveto and Maurice Shamburger, Tyler, will drill on the Shady Grove School 22-acre tract in the Daniel Minor Survey.

New work in Limestone County included a 5,100-ft. wildcat by W. B. Hinton as the 1 R. W. Carter. Location in the Thomas Stevens Survey, A-499, is 9 miles northwest of Thornton.

K. L. McHenry, Lufkin, has filed application to drill 1 George Abraham as a 7,500-ft. Robertson County wildcat. Location is in the Dennis Haggerty Survey, 5 miles southeast of Bremond.

EAST TEXAS (DISTRICTS 5 AND 6) WILDCAT FAILURES

Bowie County: Renwar Oil Corp. et al 1 McCoy, Leroy W. Ross Sur., dry, TD 3,561 ft.

Kaufman County: William Salaman 1 Robt

E. C. "Jug" Bennett, Jr.,
Bennett Well Service,
Graham, Texas
Says . . .

"WALKER-NEER FEATURES ENABLE ME TO . . .

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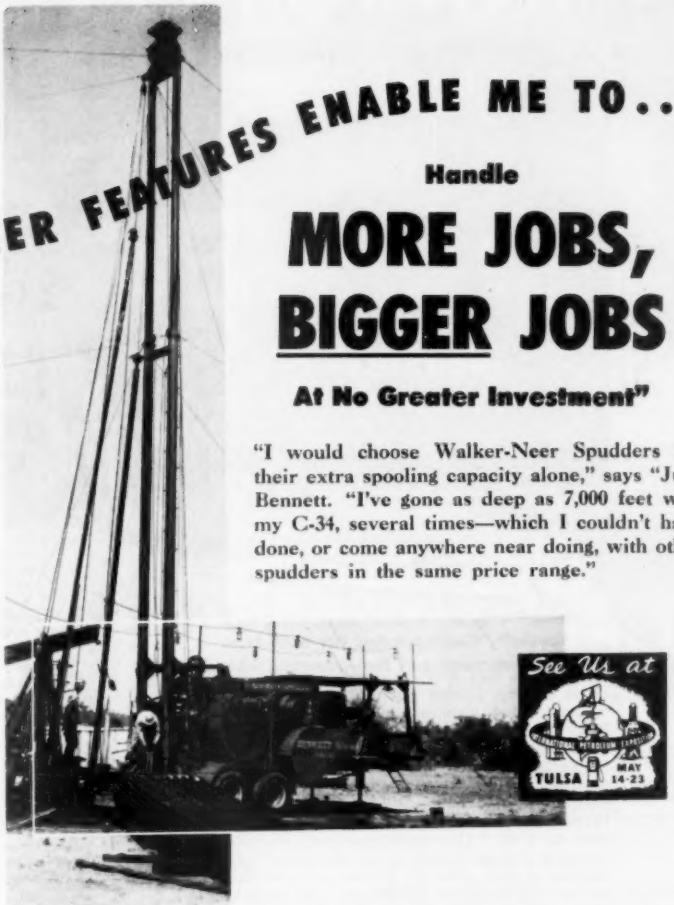
MORE JOBS, BIGGER JOBS

At No Greater Investment"



"I would choose Walker-Neer Spudders for their extra spooling capacity alone," says "Jug" Bennett. "I've gone as deep as 7,000 feet with my C-34, several times—which I couldn't have done, or come anywhere near doing, with other spudders in the same price range."

- Traveling spudding sheaves and heel sheaves attached to the spudding beams eliminate spooling problems.
- Each drive has an independent clutch; all controls, including a double cathead, are conveniently arranged at one operator's platform.
- The exclusive "Tor-Shock" (Rubber Torsion) Shock Absorber provides the quietest, most jar-free drilling motion ever known, gives the tools extra snap.
- Quiet, efficient V-belt and High-Speed Roller-Chain design provides extra power for hoisting greater loads out of the hole at top speed.
- V-Belt drive from engine to clutch shaft prevents slippage, increases power and efficiency under adverse conditions.
- All drums and mast-head sheaves are mounted on ball or roller bearings, require no lubrication during the period of drilling a well.
- Double self-energizing brakes on all drums assure a maximum of braking power.
- Walker-Neer Spudders, featuring an improved Tandem axle, provide an all-time high in fast, safe portability, as well as in ease of setting up and tearing down.

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MODEL	½" Line		9/16" Line		⅝" Line		¾" Line		⅞" Line		1" Line	
	Drill Drum	Sand Reel	Drill Drum	Sand Reel	Drill Drum	Sand Reel	Drill Drum	Sand Reel	Drill Drum	Sand Reel	Drill Drum	Sand Reel
WS-31		1,450'			3,000'		2,100'		1,600'			
S-32		5,000'		4,000'	6,900'	3,400'	5,000'		3,500'			
S-32 — Special		6,000'		5,000'		4,000'	5,500'		4,000			
S-33				2,600'		7,000'	8,600	5,000'	6,300			
S-310				16,000'		13,000'	16,200	9,000'	12,000'		9,200'	
C-33				5,200'		4,200'	5,000'		3,600'			
C-34				8,180'		6,700'	7,400'		5,500'			
C-37				9,300'		7,500'	11,500'	5,200'	8,500'		6,500'	

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Drummond, Marie Delores Soto Sur., A-455, dry, TD 3,149 ft., Woodbine 2,544 tf., Georgetown 3,125 ft.

Thos. D. Humphrey & Sons 1 Rosie George, J. C. Jacobs Sur., dry, TD 4,202 ft.

Van Zandt County: F. R. Jackson and J. M. Deupree 2 J. B. Roberts, John Jackson Sur., dry, TD 4,667 ft.

Wood County: Hollandsworth Oil Co. 2 D. B. Clonts, Brooks & Burleson Sur., A-92, dry, TD 5,650 ft.

Ralph Spence and Watburn Oil Co. 1 Richard Kelly, L. G. Powers Sur., A-457, dry, TD 5,565 ft.

Texas Gulf Coast

Fifth Pay Opened In South Hampton Area

HOUSTON. — American Republics Corp. and Houston Oil Co. of Texas have opened new oil pay at the South Hampton area of Hardin County, Texas at the 5 Henry Binns fee, marking that field's fifth pay zone. The 8,500-ft. venture is perforated with 30 shots from 7,846-51 ft. and producing 67.6 bb. of 39.2°-gravity oil daily while on potential. Flow was effected through a 10/64-in. choke, under a tubing pressure of 260-340 psi., posting a gas-oil ratio of 951-1. Well lies 6 miles northwest of the town of Silsbee in the Henry Binns Lge.

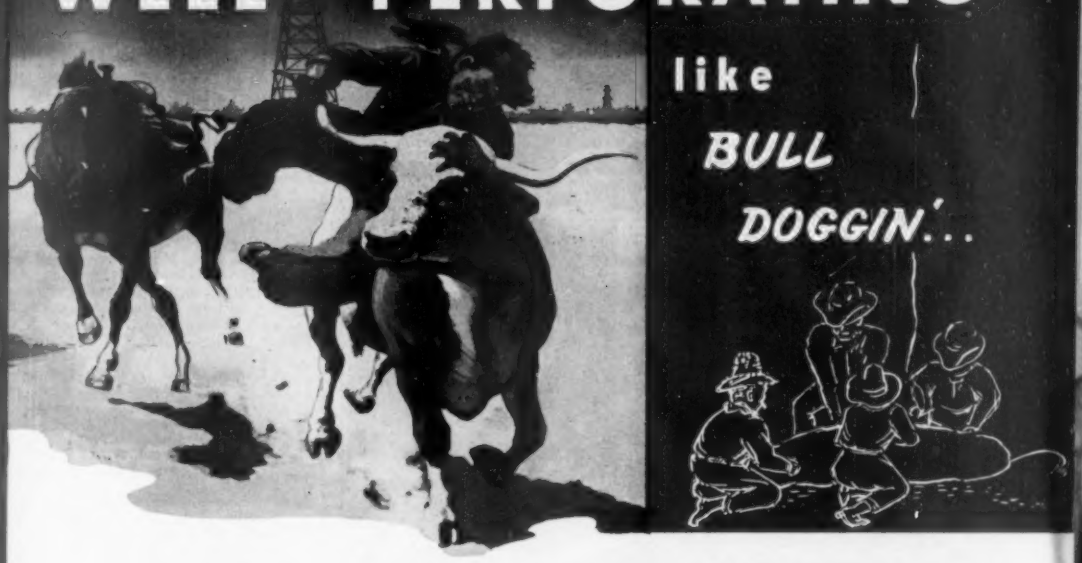
Also in Hardin County, 1½ miles east-northeast of Arriola field, J. R. Butler and associates continue to bore hole at the 1 J. L. Hooks estate below 10,052 ft., preparing to wind up operations soon. Well was originally projected to 10,000 ft., lying on the J. F. Callahan Survey, A-558. Shallow production is obtained at nearby Arriola field, yielding gas and low gravity oil from the Miocene at 2,298-2,310 ft., gas at 2,694-13 ft., and oil from various other levels down to 5,440 ft.

Ada Oil Co. and Hurt Oil Co., Ltd., have found new Yegua oil production in Jasper County 5 miles northwest of the town of Buna. Operator's 1 Hardy Richardson drilled to 8,155 ft. and after cementing production string, perforated opposite the Yegua from 7,198-212 ft. When placed on a ⅛-in. choke the well produced 183 bbl. of 37.8°-gravity oil daily, having a tubing pressure of 1,050 psi., with a gas-oil ratio of 535-1. The new oil strike lies north-northwest of Buna field and west of West Castillo field.

Phillips Petroleum Co. has opened a new gas-distillate pay in prolific Chocolate Bayou field in Brazoria County. The firm's 1 Houston "S," a test on the southwest flank of the field, flowed 354 bbl. of distillate and 7,357,000 cu. ft. of gas daily on a 14/64-in. choke from lower Frio perforations at 12,043-53 ft. Total depth of well was 13,319 ft. Phillips holds approximately 22,000 gross acres of lease in its block of Chocolate Bayou field leases, of which over 9,000 acres are producing from 12 oil, gas and distillate formations.

Robin & Haas Co., operating from Pasadena, Texas, have staked the 1 Rohm & Haas Fee, to confirm new Deer Park gas production in Harris County. To go down to 6,000 ft. the location falls on the J. M. Patrick Survey, A-624, 3 miles east of the townsite of Deer Park. Exact location spots the well 1,770 ft. southwest of Hunt's 1 Curtin discovery, Hunt's 1 Curtin, drilled hole to 8,556 ft. and after perforatings from 5,452-62 ft. in the Frio well produced 40,000,000 cu. ft. of gas daily recording a shut in

WELL PERFORATING—



. . . takes a lot of KNOW-HOW to avoid losing your hide!

Yes sir, when it comes to perforating your well, you're tackling a job that's hotter than all hell with the blower turned on! You can take it from us, **mother nature** guards her oil just like a **cow** protects her fresh-branded calf . . . they may both be mothers, "but they sure ain't no ladies!"

And it's a smart operator who realizes that his entire well investment can pay off — or take his hide — depending on the **know-how** of the perforating service he calls in.

Now sir, we don't want you to think our tongue is tied in the middle and clapping at both ends . . . but let us quote from a letter that a leading oil operator wrote to another concern last year: "Our experience **proves** that PGAC has no equal when it comes to effective well perforating. Bullets or jet shot, they deliver the oil to us!"

DON'T STRETCH YOUR LUCK!

Another operator recently told us: "Only after seeing your equipment and your gun-crews in action did I realize how far I had previously stretched my luck . . . how I had risked the safety of my wells (as well as my 'hide'!) by using perforating services that overlooked many possibilities of dangerous consequences."

It's true, PGAC does enjoy an outstanding reputation for **safe perforating.** That's due to our great advances in developing foolproof guns and firing controls. PGAC's **uncanny accuracy in depth determination,** and our **deeper penetration,** are likewise the result of advanced engineering achievements.

Whether it's jet shot or bullets, we'd like to perforate your next job so you can see for yourself **why** so many leading operators prefer PGAC services. If you'll write or telephone us today, we'll be glad to send you our New Catalog — it explains the **why** and the **how** of all the advantages here mentioned. We'll be looking forward to hearing from you!

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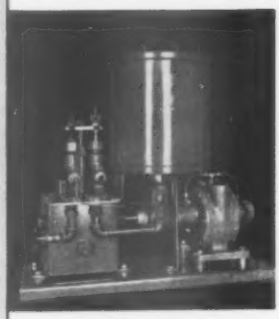
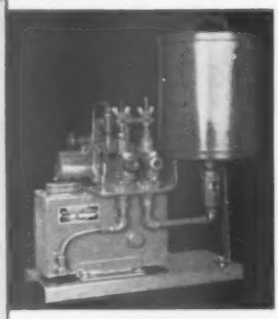


ROTARY GAS DRIVE



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pressure of 2,151 psi. In addition to the gas flow, well produced some 50.2°-gravity condensate with a ratio of 336,700-1.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Brazoria County: Greenbrier Oil Co. 1 H. C. Munson, Samuel Carter Sur., A-53, TD 11,481 ft., PT 274.31 bbl. of 36.2°-gravity oil per day on 10/64-in. choke, gas-oil ratio 931-1.

Colorado County: C. N. Housh-American Republics Corp. 1 Lillian Reese, J. Hadden Sur., New Pay, TD 9,946 ft., PT 51 bbl. of oil per day on ¼-in. choke, 34.4°-gravity oil, gas-oil ratio 4,250-1.

Galveston County: Hassie Hunt Trust 1 Mrs. A. David, Lemuel Crawford Sur., A-48, TD 10,910 ft., PT 171.12 bbl. of oil per day on 8/64-in. choke, 36.6°-gravity oil, gas-oil ratio 1,107-1.

Grimes County: J. M. West 2 Olla Heath Garrett, A. B. Dodson, TD 9,370 ft., PT 2,500,000 cu. ft. of gas and 25 bbl. of oil per day on ¼-in. choke, 48°-gravity oil.

Harris County: K&H Operating Co. 1 J. H. Simmons, M. McCauley Sur., A-577, TD 7,515 ft., PT 43 bbl. of 40.5°-gravity oil per day on ⅞-in. choke, gas-oil ratio 10,900-1.

Jackson County: Highland Oil Co. 1 Bessie Hudgins et al, V. A. LaBauve, Sur., A-691, TD 7,200 ft., PT 182.16 bbl. of 25°-gravity oil per day on 13/64-in. choke, gas-oil ratio 655-1.

Jasper County: Ada Oil Co. and Hurt Oil Co., Ltd. 1 Hardy Richardson, J. D. Johnson Sur., A-21, TD 8,155 ft., PT 183 bbl. of oil per day on ⅛-in. choke, 37.8°-gravity oil, gas-oil ratio 535-1.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Bee County: J. W. Gorman 1 Cordelia Carr, M. P. H. Love Sur., TD 4,471 ft., dry.
W. Earl Rowe 1 Sudie Scott, Juan de Deios Molina Sur., A-41, TD 3,760 ft., dry.

Colorado County: Warren Petroleum Co. and National Bulk Carriers, Inc. 3 Joe J. Hanak, W. K. Paulding Sur., A-463, TD 3,393 ft., dry.

DeWitt County: Imperial Producing Corp. A-1 D. H. Heaton, Manuel Manchaca Sur., A-334, TD 7,833 ft., dry.

Fort Bend County: Fort Bend Oil Co. 1 John M. Moore Est., Nancy Spencer Sur., A-88, TD 4,196 ft., dry.
Hunt Oil Co. 1 John M. Moore et al, W. T. Austin Sur., A-5, TD 7,510 ft., dry.

Goliad County: Alkek Oil Co. and Paul J. Fly 1 U. S. Lott, Lafayette Ward Sur., A-299, TD 4,516 ft., dry.
2nd M. E. Andrews, Ltd., and Husky et al 2 R. F. Wilkerson, Jos. Callahan Sur., A-81, TD 3,114 ft., dry.

Harris County: B. B. M. Drilling Co. 1 W. O. Bartle, Wm. White Sur., A-829, TD 6,415 ft., dry.
The Texas Co. 2 J. Galbow, R. N. Davis, Sur., A-225, TD 8,190 ft., dry.

Jackson County: John B. Coffee 1 Gus Eglemohr, Morris & Cummings Sur., A-302, TD 8,035 ft., dry.
J. M. Huber Corp. 1 Rose & Sample, John Andrews Sur., A-4, TD 5,150 ft., dry.

Live Oak County: Heep Oil Corp. et al 1 Wm. A. Harlan et al, L. A. Fant Sur., A-601, TD 7,520 ft., dry.
Dallas Husky 1 C. C. Wuthrich, Jno. Turner Sur., A-38, TD 1,557 ft., dry.

Orange County: Hurt Oil Co. 1 Alvoid Garrison, James Dyson Sur., A-8, TD 9,667 ft., dry.

Refugio County: The Chicago Corp. 1 Mrs. Jamie Hynes, John Nalone Sur., A-46, TD 7,020 ft., dry.

Wharton County: Drilling & Exploration Co.,

Inc. 1 J. G. McMurtry, Frank Page Sur. 44, A-477, TD 5,402 ft., dry.

J. M. Faitz and R. B. Mitchell 1 Guess Unit, S. A. Larche Sur., TD 8,010 ft., dry.

G. S. Hinkle and C. B. Webster et al 1-A Mentor Northington, J. W. Jones Sur., A-35, TD 5,012 ft., dry.

Louisiana-Ark.

Smackover Test Flowing Oil In Monroe Field

SHREVEPORT.—American Republics Corp. is reportedly swabbing and flowing oil by heads at their 1 Olin-Interstate-ARC Fee, Smackover test in old Monroe field, Union Parish. Operator is testing an estimated 7 ft. of broken porosity through perforations at 9,068-89 ft. Bottom of the hole is at 9,396 ft. and was cased to 9,150 ft. After perforating from 9,068-89 ft. the operator swabbed the well dry, recovering some oil. Crews reperforated from 9,080-86 ft. swabbing the hole dry. After acid treatment the well began making oil by heads during the swabbing.

A. J. Hodges Industries, Inc., was coring below 11,245 ft. after recovering a 25-ft. core in the Smackover's Gray sand at 1 Pardee-Calloway et al, Section 35-21n-11w, on the southwest flank of the Cotton Valley structure in Webster Parish. The core was taken from 11,220-11,245 ft. The operator stopped at 11,220 ft. prior to cutting this core and cemented 7-in. casing at 11,209 ft. Four days were necessary to prepare the hole for running casing due to the caution needed when strong pressure was exerted. Development in this area would be greatly stimulated if the test proves productive due to its location 4½ miles west and 1 mile south of the nearest Gray sand producer.

Arkansas.—Sneed Brothers have completed 1 J. H. Hughes estate, C NW SE NW 29-15s-19w, opening a new Hogg sand area for Stephens field in southwestern Ouachita County, south-central Arkansas. The new oil well flowed 10 bbl. of 31°-gravity oil per hour through open 2-in. tubing from perforations at 3,178-91 ft. At 1 Laney Jones, SE SW SW 29-15s-19w, immediately southwest of the new producer, Sneed Bros. are perforating. This well also found saturation in the Hogg sand interval.

LOUISIANA WILDCAT FAILURES

Bienville Parish: Sohio Petroleum Co. et al 1 Gaston, C NE SW 1-14n-5w, dry, TD 10,100 ft.

Catahoula Parish: Southwest Gas Producing Co. 2 Tensas Delta Lumber Co., 9-8n-5e, dry, TD 5,186 ft.

Claiborne Parish: Continental Oil Co. 1 McCranie, C SW SW 21-21n-8w, dry, TD 10,018 ft.

DeSoto Parish: R. W. Norton et al 1 Goss, C SW SE 4-12n-13w, dry, TD 3,010 ft.

Sunray Oil Corp. 1 Olin Industries, Inc., SWc SE NW 8-10n-14w, dry, TD 7,000 ft.

Casey-Weempe Oil Co. 1 Johnson, SWc SE NW 3-10n-13w, dry, TD 3,925 ft.

LaSalle Parish: Justiss-Mears Oil Co. 1 School Board, C NW NW 16-6n-4e, dry, TD 5,112 ft.

ARKANSAS WILDCAT FAILURES

Columbia County: Burnett Drilling Co. 1 Thomas Est., "A," NEc SE NW 4-16s-19w, dry, TD 2,256 ft.

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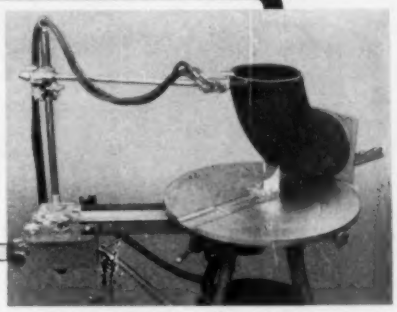

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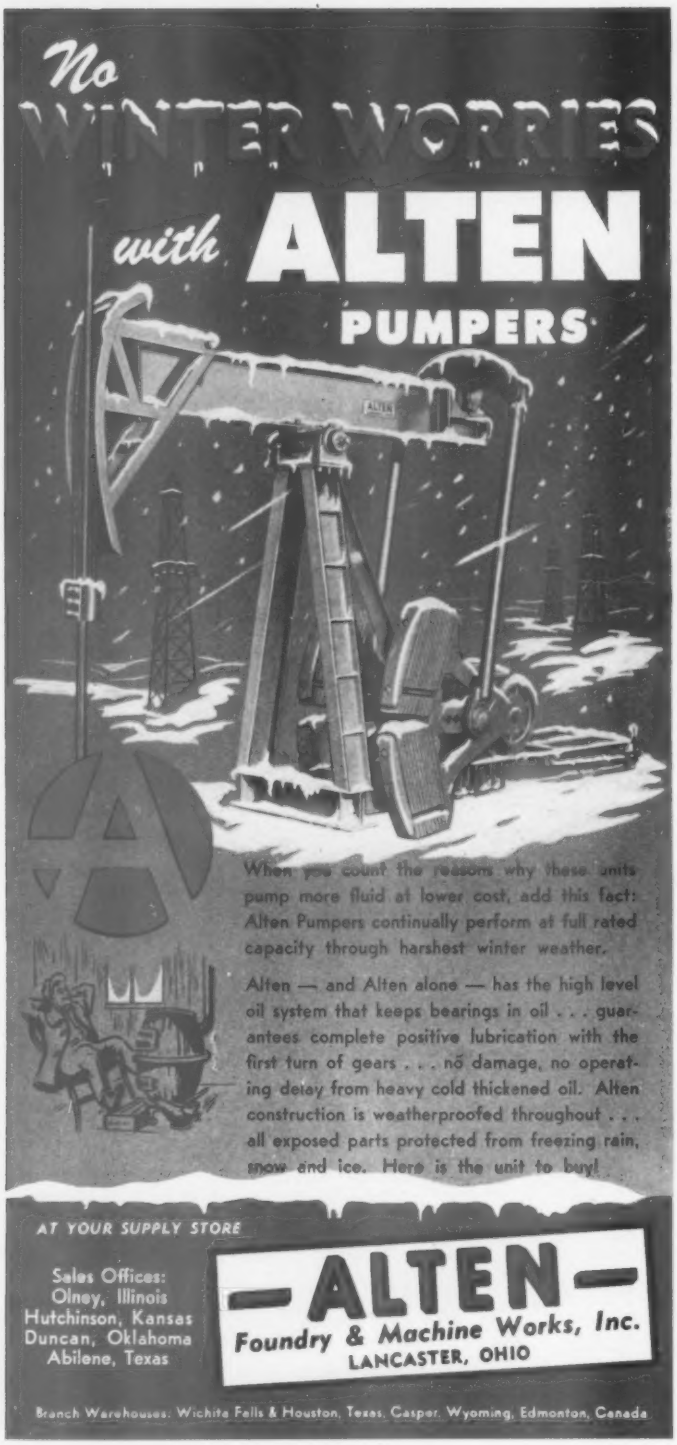
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Lafayette County: McAlester Fuel Co. 1 Warnock-Lecroy "A," 12-20s-24w, dry, TD 7,515 ft.

Mississippi

Jefferson Wildcat Finaled In Tuscaloosa Sand

JACKSON.—In Jefferson County, Mississippi, approximately 6,000 ft. northeast of the one-well Rodney field, the B. Serio-W. C. Proctor 1 Logan, Section 8-10n-1w, has been completed as a good oil well. Completion is from perforations 9,578-81 ft. opposite lower Tuscaloosa sand. On potential test the well flowed at the rate of 168 bbl. of 47°-gravity oil per day through 9/64-in. choke with tubing pressure 1,775 psi. Flow was cut with 9 per cent salt water and gas-oil ratio was 1,830-1. Cores and electric log indicate approximately 9½-ft. of gas sand and 13½ ft. of oil sand in this zone.

In northwestern Jefferson County, Mississippi, Atlantic Refining Co. 1 Phillips et al, Section 10-10n-2w, appears to be a small discovery from the lower Tuscaloosa. On original test of perforations 9,200-04 ft. the well flowed at the rate of 150-175 bbl. of 43.5°-gravity oil per day plus 10 to 12 per cent salt water. Perforations were squeezed and same interval reperforated. After swabbing in the well flowed at the rate of 48 bbl. of oil plus 25 per cent salt water per day on an 8 hour test through 10/64-in. choke with tubing pressure 400 psi. On 10-hour test on 8/64-in. choke it flowed at the rate of 40 bbl. of oil plus 35 per cent salt water per day with tubing pressure 475 psi. The well is now shut in for storage.

In Monroe County, Mississippi, approximately 6 miles northeast of Muldon field, the Shell Oil Co. 1 Mrs. Lee Harrington, Section 25-14s-6e, is waiting for potential test as a new Paleozoic gas discovery. This test was drilled to total depth of 6,122 ft. in Ordovician dolomite, then plugged back and casing was run to top of the Sanders (Chester) sand at 3,505 ft. A water free completion could not be made from open hole between the casing and cement plug. A liner was cemented in the hole at 3,532-75 ft. leaving open hole between the casing and liner at 3,505-32 ft. Tubing was run on packer at 3,403 ft. and the well was tested on various chokes for a total of 20 hours. Rate of flow ranged from 3,020 M.c.f. of gas through ½-in. choke with tubing pressure 810 psi. to 1,075 M.c.f. of gas through 12/64-in. choke with tubing pressure 1,150 psi. No water was produced during these tests. Shut in tubing pressure was 1,450 psi.

The prospective Wilcox discovery in northwestern Adams County, Mississippi, the D. Gammill-L. Cashion Co. 1 Ida Stowers et al, Section 8-8n-2w, is preparing to install pump for final completion. This wildcat was perforated 5,637-38 ft. opposite top foot of Wilcox sand carrying shows of oil at 5,637-41½ ft. When testing started the well was flowing at the rate of 65 bbl. of oil and 5 per cent wash water through ⅛-in. choke with tubing pressure 165 psi. After tubing pressure dropped to 60 psi., choke was changed to 10/64-in. and the well flowed oil and wash water for 2 hours, then died. At last report, choke had been changed to 18/64-in. and pressure had dropped 10 psi. Pumping equipment is to be installed.

MISSISSIPPI SUCCESSFUL WILDCAT

Jefferson County: B. Serio-W. C. Proctor 1 Kate S. Logan, Sec. 8-10n-1w, TD 9,605

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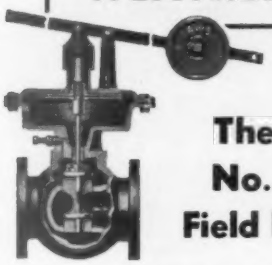

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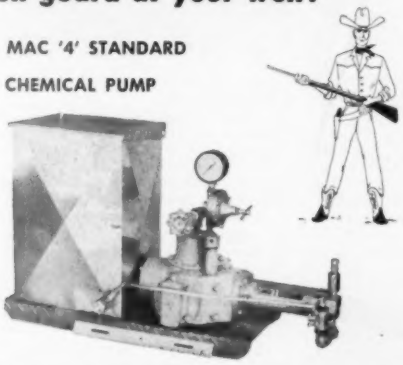

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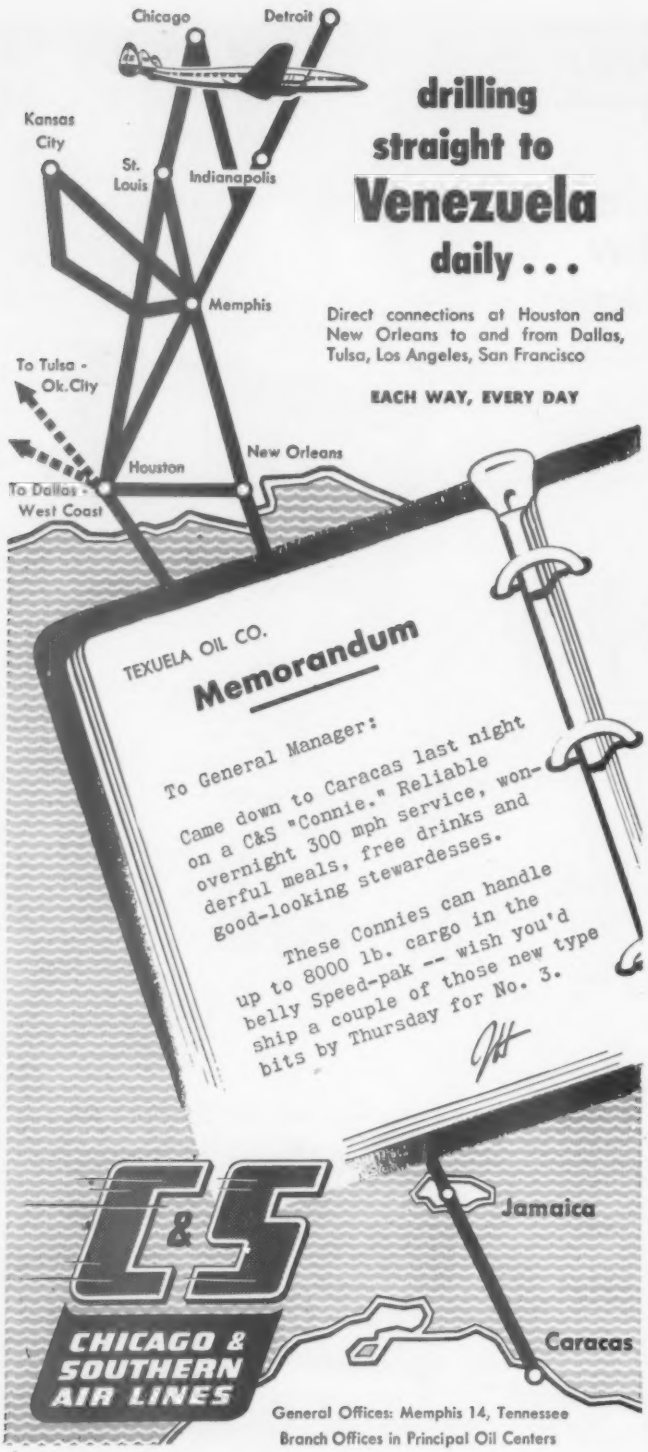
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MISSISSIPPI WILDCAT FAILURES

Jefferson County: Sunnyland Contracting Co.-John Player 1 Mrs. Mary Scott Clarey, et al, Sec. 30-8n-2e, TD 6,507 ft., dry.

Wilkinson County: Gulf Refining Co. 1 Nathan McGee, Sec. 22-3n-4w, TD 8,517 ft., dry.

ALABAMA WILDCAT FAILURES

Clarke County: Southeastern Operators Comm. 1 Mary Armstead, Sec. 16-7n-5e, TD 5,212 ft., dry.

Conecuh County: Lyle Cashion Co. 1 Grief Bros. Cooperage Corp., Sec. 34-5n-11e, TD 5,006 ft., dry.

Southwest Texas

New Producer Reported In Spartan Field

CORPUS CHRISTI.—The new Spartan field, between Sinton and Odem, San Patricio County, had an oiler in the 6,600-ft. sand at the Spartan Drilling Co.'s 2 Charles I. Lovett. On 25-minute drill-stem test at 6,607-27 ft., on ¼-in. chokes gas reached the surface in 8 minutes, and oil in 25 minutes. 20 bbl. of oil was recovered on blowdown after tool was closed, and drill pipe recovery was 1,200 ft. of oil. The 2 Lovett is on the south edge of the field about 930 ft. northwest of the Seaboard 1 Luling Oil & Gas Co., 8,828 ft. dry hole.

New gas production has been opened by Panhandle Oil Corp. about 1 mile northeast of Strake field in Duval County at A-1 Driscoll estate. Well flowed 11,750,000 cu. ft. of gas per day on open flow from perforations 2,538-48 ft. Production is from the Cole sand. Well was drilled to 2,690 ft. with an Appel Drilling Co. rig and cased to 2,689 ft. with 5½-in. pipe.

Alcoa Mining Co. and Crown Central Petroleum of Houston have staked tentative location for a 10,500-ft. wildcat south of LaWard in Jackson County. Venture is located on the Theodore F. Koch Subdivision, Block 37, Section 21, about 1,700 ft. east of the shoreline of Carancahua Bay.

Arkansas Field Oil Co. 1 Herman Fischer, Nueces County wildcat 3 miles northeast of Robstown, was drilling at 6,904 ft. with mud logger attached. Permit depth is 7,200 ft. This wildcat had been delayed by a fishing job. It is on the Gregorio Farias Survey, A-529.

Location for a 933-ft. east offset of his discovery of Riggs field in Goliad County has been staked by F. William Carr of Corpus Christi at 1 Paul Bethke. Drill site is on the Jacob Fifer Survey, about 9 miles north of Goliad. Discovery well, Carr's 1 Riggs, was completed last September flowing 42.78 bbl. of oil per day on 10/64-in. choke from perforations 4,904-07 ft. Flowing tubing pressure on initial test was 350 psi. New reservoir is about 5,000 ft. south of production in Poehler field of Goliad County.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Atascosa County: Martin, Shelly & Thomas & Ryan, Hays & Burke 1 Mary O. Miller, Galba Fuqua Sur., A-271, TD 1,689 ft., PT 5.52 bbl. of oil per day plus 30 per

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Duval County: Humble Oil & Refining Co. A-76 V. Kohler, SK&K Sur. 165, TD 4,492 ft., 4,200,000 cu. ft. of gas per day on open flow, perf. 3,244-48 ft.

Panhandle Oil Corp. A-1 Driscoll Est. J. Poitevent 213 Sur., A-386, TD 2,690 ft., 11,750,000 cu. ft. of gas per day open flow, perf. 2,538-48 ft.

Hidalgo County: The Chicago Corp. 3 W. R. Jackson, Porcion 40, TD 6,133 ft., PT 65.65 bbl. of oil per day on ¼-in. choke, 33.8°-gravity oil, gas-oil ratio 151-1, perf. with 30 shots 3,670-75 ft.

San Patricio County: Spartan Drilling Co. 3 J. W. Bullard, J. W. Bullard Subd., Blk. 4, TD 8,870 ft., PT 4,200,000 cu. ft. of gas per day open flow, 52°-gravity condensate, perf. 6,262-88 ft., gas-oil ratio 125,000-1.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Aransas County: Sun Oil Co. A-1 Copano Bay St. Tr. 98, Copano Bay, TD 2,035 ft., dry.

Sun Oil Co. A-1 St. Charles St. Lse. 368, St. Charles Bay, TD 10,492 ft., dry.

The Texas Co. 1 St. Tr. 145, Aransas Bay, TD 9,273 ft., dry.

Atascosa County: Humble Oil & Refining Co. 1 Lelia J. Wiseman, A. B. Switzer Sur. 1042, A-763, TD 6,750 ft., dry.

Shell Oil Co. 1 O. F. Frederickson, I&GN Sur., A-491, TD 1,816 ft., dry.

Slick-Moorman Oil Co. 1 Guy Smith, S. S. Smith Sur., A-1434, TD 2,856 ft., dry.

Bexar County: Hassie Hunt Trust Estate 1 Esperanza Ranch, Mariana Seguin 2 Lge. Grant, A-19, TD 3,489 ft., dry.

Brooks County: Humble Oil & Refining Co. 3 Robert J. Kleberg-Los Muertos Pasture, La Morta de Tio Ayola Grant, TD 8,056 ft., dry.

Duval County: Birdwell Oil Co. 1 Rafael Garcia, Jose Marcelo Ynojosa Sur., A-628, TD 4,410 ft., dry.

Frio County: I. K. Howeth 1 Luther Smith, GC&SF 3, A-946, TD 3,949 ft., dry.

Henry C. Slavik 1 Gladys T. McDonald, Camilla Cuples 173, A-267, TD 3,820 ft., dry.

Hidalgo County: The Chicago Corp. 1 Moises Casas, Share 10-B & 11, San Ramon Grant, TD 7,631 ft., dry.

Gonzales County: H. A. Pagenkopf 1 Schnable, Thos DeCrew 68, TD 1,815 ft., dry.

Guadalupe County: A. L. Duff, Jr., and Starwn Drilling Co. 1-A Roy Wagner, Robert Hall Sur., TD 2,445 ft., dry.

Kimble County: Anzac Oil Corp. 4 H. H. Lawler, TWNG Sur., Blk. 15, TD 2,040 ft., dry.

Nueces County: Panhandle Oil Corp. 1 John Grant et al, Isaac Boone Sur., A-43, TD 9,010 ft., dry.

Travis County: G. L. Reasor 1 Fritz Heine, Noel M. Bain Sur., TD 1,050 ft., dry.

Webb County: Killam & Hurd 1 Garcia Est., HE&WT 463, TD 2,595 ft., dry.

Glen G. Mortimer, Jr. 3 R. E. Welhausen, CCSD&RGNG 18, TD 2,690 ft., dry.

Willacy County: Humble Oil & Refining Co. 4 Sauz Ranch-Nopal, San Juan de Carricitos Grant, TD 9,500 ft., dry.

Wilson County: Thomas Jordan, Inc. 1 Henry Horzewka, Juan Vela Sur., A-334, TD 4,425 ft., dry.

Zapata County: Long Bros. et al 1 Juan Gutierrez, Charco de la Indio Grant, TD 4,504 ft., dry.

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Long East Extension Added to Magutex Field

MIDLAND.—Magutex field of Andrews County received a long east extension and confirmation well in the Devonian at Humble Oil & Refining Co. 1-Q University in SE SW Section 15.

Top of the Devonian was found at 12,458 ft., said to be some 60 ft. high to the Devonian in Magnolia's field discovery. Drill-stem test from 12,460-87 ft., using 2,450 ft. of water blanket, had oil at the top in 102 minutes. After cleaning into pits for 3 minutes, the flow gaged 95 bbl. of 44°-gravity oil in 1 hour through ⅝-in. choke. Operators were to core ahead.

Northwest Lynn County had a Pennsylvanian reef discovery in the making at Dan Auld 1 J. A. Timmons, which flowed oil estimated from 25-40 bbl. hourly on drill-stem test between 9,765-9,874 ft. Top of the reef was 9,825 ft., minus 6,569 ft. Operators were to run electrical surveys and make completion attempt from the pay.

In southern Upton County, Trebol Oil Co. and E. G. Rodman 1 Radford Grocery, GC&SF Survey 1, 10 miles east of McCamey, found discovery in the shallow Grayburg limestone, and from 9 ft. of open hole, completed for a natural flowing potential of 960 bbl. of 26°-gravity oil a day. The gage was through ½-in. choke and flowing pressure was 150 psi. Top of the lime was 1,729 ft. on elevation of 1,729 ft. and top of porosity was 1,745 ft. The test was originally scheduled to 3,500 ft. but stopped drilling at 1,754 ft. Operators will drill north, south and west offsets and have asked for new field designation with 10-acre spacing.

In northern Scurry County, The Texas Co. 2 Fuller, southwest outpost to the company's Strawn discovery, recovered gas and heavily oil and gas-cut mud on a drill-stem test in the Mississippian limestone from 7,802-13 ft. It drilled soft to 7,822 ft. and another test was to be made. Top of the lime was 7,807 ft., and minus 5,395 ft.

Completion was reported for Cities Production Co. 1-D Starnes, Fusselman discovery in southeast Terry County. Calculated potential of 1,531.48 bbl. of 39°-gravity oil was based on a 9-hour flow test of 575 bbl. through ¼-in. choke. Top of the Fusselman was 11,622 ft. on elevation of 3,167 ft. and perforations were from 11,622-640 ft.

Southwest of the new Statex field, southwest Terry County, Fred Turner Jr. 1 Rawls prepared to complete as a Pennsylvanian reef discovery. Tests on perforations at 10,064-84 ft. averaged 160 bbl. of oil a day.

Great Western Drilling Co. 1 Clare, Glorietta discovery in western Terry County, prepared to drill plug on casing set at 5,907 ft. and complete. The same firm located 2 Clare as an east offset, to be drilled to the same pay.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCATS

Coke County: Lion Oil Co. 1 Mary Rawlings, 390-1A-H&TC, TD 5,677 ft., elev. 1,906 ft., Gardner 5,310 ft., IP 868 bbl. 50°-gravity oil, 16/64-in. choke, GOR 111 cu. ft.

Glasscock County: Honolulu and Signal 1 T. H. Matthews, 11-8-Howard CSL, 9,370 ft., elev. 3,401 ft., reef 9,260 ft., pay 9,280 ft., IP 1,673 bbl. 42°-gravity oil, 1-in. choke, TP 120 psi., GOR 351 cu. ft.

Kent County, Salt Creek extension: General American Oil Co. 1 Atkinson Unit, 114-G-W&NWR, TD 6,659 ft., elev. 2,158 ft., reef 6,620 ft., IP pumped 115 bbl. 40°-gravity oil.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Garza County: L. F. Long 1 Long, Sec. 1,112, A-1,009, TTRR Sur., dry, TD 3,500 ft., elev. 2,457 ft., San Andres 2,125 ft.

Glasscock County: Hubbard S. Russell et al 4 Wrage-Hendrickson B-20, 20-36-T3S-T&P, dry, TD 12,212 ft., elev. 2,598 ft., Strawn 10,228 ft., Devonian 11,024 ft., Silurian 11,436 ft., Ellenburger 12,035 ft.

Howard County: Greenbrier Oil Co. 1 Mrs. P. A. Rutledge, 57-20-LNC Sur., dry, TD 7,805 ft., elev. 2,356 ft., reef 7,540 ft.

Edward C. Lawson 1 Tant Lindsey, 30-33-T&P, dry, TD 4,740 ft., Clear Fork 4,454 ft.

Robinson Drilling Co. 1 Herman Gartner, 67-20-LaVaca Navigation Sur., dry, TD 4,800 ft., elev. 2,334 ft., San Andres 2,095 ft.

Kimble County: Anzac Oil Corp. 2 H. H. Lawler, 9-15-TW&NG Sur., dry, TD 2,068 ft., Strawn 1,427 ft., Ellenburger 1,960 ft.

Anzac Oil 4 H. H. Lawler, 2-15-TW&NG, dry, TD 2,040 ft., Ellenburger 1,960 ft.

Midland County: G. E. Hall 1 H. S. Foster, 10-41-T2S-T&P, dry, TD 10,720 ft., elev. 2,892 ft., Strawn 10,510 ft.

Mitchell County: F. Kirk Johnson 1 W. P. Bomar, 10-12-H&TC, dry, TD 6,955 ft., elev. 2,173 ft., Pennsylvanian 6,905 ft.

Pecos County: George T. Abell 3 Sloan Blair, 35-10-H&TN, dry, TD 2,705 ft., elev. 2,430 ft., San Andres 2,330 ft.

(Continued on page 460)

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California

Deeper Pay Added To Guadalupe Field

LOS ANGELES.—Guadalupe field of San Luis Obispo County, coastal region, was given a deeper pay upon recompletion of Thornbury Drilling Co. C-4 LeRoy in 1-10n-36w. When completed last December in the regular Sisquoc (Pliocene) sand at 2,685-2,761 ft., the well pumped 60 bbl. daily of 12.5°-gravity crude. When recompleted as a dual producer at 2,685-3,287 ft., with the top of the Knoxville (upper Jurassic) called at 2,761 ft., the well produced about 300 bbl. daily of 10.5°-gravity crude.

This production was by far the largest of any well completed in the field so that additional development of the new Knoxville pay was to be started immediately.

Sisquoc pool, containing about 30 producers, is believed to have a productive area of more than 2,000 acres. Potentialities of the Knoxville have been tested by only a few wells—thus its extent is yet to be determined.

Western Gulf Oil Co. was preparing to start a wildcat about 6 miles north of San Ardo field and planned to start another test 6 miles further north. In the Pancho Rico area, 2-22s-10e, preparations were under way to spud 1 Orradre. Following this test the second will be drilled in NE 24-21s-10e.

Near Oxnard the deep-zone test of Standard Oil Co. of California had reached a depth of 4,873 ft. and hole was being reamed to bottom. The wildcat, 1 McInnes, is in 6-1n-21w, in an area where present production is from 2,500 to 3,000 ft.

The Torrey Canyon extensioner of The Texas Co., 1 Hunter, stuck drill pipe while the string was being pulled from 8,304 ft. and effort still was being made to retrieve some of the drill collars. Located more than ½ mile west of production, in NE 6-3n-18w, the wildcast is considered by some geologists familiar with the area to be an assured producer in the deep Sespe pool discovered by Union Oil Co.

On the eastern end of Santa Clara Valley, Los Angeles County, Texaco had reached a depth of 500 ft. at its wildcat west of Castaic Junction. Located in 11-4n-17w, progress of 1 Newhall-B will be closely watched because of its relative location to the Castaic Junction, Honor Rancho, Oak Canyon, and Del Valle fields.

In SW 28-4n-16w, General Exploration Co. was scheduled to start 2 Newhall Land & Farming by February 1. A 10,000 to 11,000-ft. test, it will be drilled about 1¼ mile southeast of the 12,478-ft. dry 1 N. L. & F.

San Joaquin Valley developments included a probable ¼-mile west extension to the two-well Los Lobos field. On a formation test at 6,745-90 ft., Richfield Oil Corp. 57-20 C.C.M.O. yielded 4,650 ft. of oil. Following the test pipe was set at 6,790 ft., plugged back from 6,870 ft.

At Wheeler Ridge the company added its fourth producer in the 10,000-ft. Eocene pool. On a 2-hour gage 16-28 K.C.L.-D flowed at a daily rate of 1,334 bbl. through a 18/64-in. bean. About 6 miles southwest of Taft, in 31-32s-23e, Richfield was grading location for a 10,000 ft. or deeper Eocene test.

CALIFORNIA SUCCESSFUL WILDCAT

Kern County, Bellevue field, ½ mile extension in lower Stevens zone: Superior Oil Co. 25-35 Berchtold, NW SW 35-29s-26e, flowed 86 bbl. per day through

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CALIFORNIA WILDCAT FAILURES

Alameda County, Livermore area: The Texas Co. 1 Hancock-Signal-Gordon, 21-2s-2e, dry, TD 6,931 ft., elev. 572 ft.

Fresno County, Burrel area: Signal Oil & Gas Co. 85-20 Signal-Burrel, 20-16s-18e, dry, TD 7,207 ft., elev. 205 ft.

Kern County, Arvin area: The Texas Co. 2 Di Giorgio A, 11-31s-29e, dry, TD 4,661 ft., elev. 513 ft.

Belgian Anticline area: Trico Oil & Gas Co. 1 Stone, 30-30s-22e, dry, TD 7,338 ft., elev. 1,578 ft.

Kern River area: Tanksley Oil Co. 1 Alma Zanetti, 17-28s-28e, dry, TD 1,225 ft., elev. 1,116 ft.

Rosedale area: Atlas Oil Co. and Wm. R. Whittaker Co., Ltd., 1 Neufeld Comm., 19-29s-27e, dry, TD 7,476 ft., elev. 380 ft.

Tunis Creek area: Reserve Oil & Gas Co. 99-20 "Well," 20-11n-18w, dry, TD 2,879 ft., elev. 835 ft.

Los Angeles County, Newhall area: J. L. Watkins 1 Thompson, 12-3n-16w, dry, TD 2,163 ft., elev. 1,568 ft.

San Luis Obispo County, Cuyama Valley area: C. W. Colgrove 82-16A Russell, 16A-11n-28w, dry, TD 3,130 ft., elev. 1,665 ft.

Appalachian-Ohio

Tioga County Test Completed as Dry

COUDERSPORT, Pa.—In Elk Township, Tioga County, Pennsylvania, Bugg Drilling Co. has completed 1 Abby Brewster as a dry hole in the Oriskany. Oriskany was encountered from 7,289-7,310 ft. (elev. 2,380 ft.) Test is at present shut down at 7,312 ft. waiting on orders. Location is 12 miles northeast of Leidy Oriskany field and located on Chestnut Ridge anticlinal trend.

Plans for another sub-Devonian test in the closely folded Appalachian area of Central Pennsylvania were recently announced. Several large coal companies are organizing an exploration company to drill in the Northumberland County area.

Thirty-five miles northeast of the proposed Northumberland County drilling area a sub-Devonian test is being drilled in Huntington Township, Luzerne County. This test, 1 Nellie Harrison of John T. Galey, is currently at a depth of 2,000 ft.

In Benezette Township, Elk County, Delta Drilling Co. has cleared location on 1 Sagamore Big Game Club. Location is 2 miles east of recent wildcat discovery, Keta's 1 Charleroi Mt. Club.

Deep Rock's 1 Walizer in Greene Township, Clinton County is drilling at 1,200 ft. in Ordovician formations.

In Falls district, Fayette County, West Virginia, Hope Natural Gas Co. 9763 Guy D. Brown, resulted in 4,197,000 cu. ft., gas, in the Big lime and was completed at total depth of 1,732 ft. Portland district, Preston County, Cumberland & Allegheny Gas Co., 1-484 T. Lewis, was completed with a final open flow of 1,105,000 cu. ft., gas chert 4,826 ft., Oriskany sand, 4,971 ft., gas 4,978 ft., TD 5,098 ft.

In Washington Township, Greene County, Southwest Pennsylvania, Chas. Young et al 1, Ira H. Martin, originally gaging 411,000 cu. ft. gas, in the Gantz sand at a total depth of

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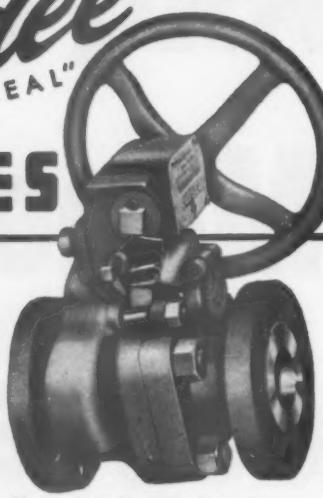

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2,856 ft., now tests 1,000,000 cu. ft. Location has been made for No. 2 Unity Township, Westmoreland County, Peoples Natural Gas Co. 4008, J. R. Frola, recorded the Tully Lime at 7,351 ft., and is drilling at 7,383 ft.; No. 4003 A. J. Dotterway, is drilling at 8,733 ft. Greenville Township, Somerset County, New York State Natural Gas Corp. 1-320 M. V. Newman, is shut down at 1,512 ft.

OHIO

Sizable pool in the north part of New Castle Township, Coshocton County, was confirmed by Roy Weed et al 1 Clarence Lang, Lot 13, ½ mile southeast of the discovery on the 1 Horn. Clinton sand at 3,075-3,128 ft, filled oil to the top of the hole natural, and flowed 150 bbl. in 24 hours after shot.

After three failures, a second well was found along the Jackson-Clay Township line, on 1 Mamie Taylor, Section 16, Jackson Township, Knox County. Clinton at 2,686-2,712 ft. made 60 bbl. in 24 hours after shot.

National Gas 2 Lewis Luman, Section 7, Harrison Township, Muskingum County, in an area long inactive, found the Medina sand at 4,363-70 ft. with 13 bbl. natural. After a 30-qt. shot, the oil increased to 50 bbl. in 24 hours with 250,000 cu. ft. gas.

Canadian Fields

Discoveries Continue At Steady Pace In Region

CALGARY.—Another four wildcats were chalked up as oil discoveries in western Canada during the past week, two each in Alberta and Saskatchewan, boosting the west's discoveries for the initial sixteen days of 1953 to eight—an average of one every 2 days. Six of this year's strikes are in Alberta, while two are in Sakatchewan.

The new Alberta finds came in the Eyremore and South Camrose regions of the province, while the Saskatchewan strikes were at Forget and North Premier. All have indicated prospects for commercial production.

At Eyremore, the Royalite-Triad team, on farmout lands from Anglo Canadian and associates, 75 miles southwest of Calgary, struck light gravity crude oil in the D1 zone of Devonian. That venture Royalite-Anglo 1 Eyremore, LSD 4, 21-18-18w4, tested interval 4,781-4,790 ft. and received 2,700 ft. of 41.6°-gravity oil. There was also a gas flow which contained some naphtha during test.

String of 7-in. casing has been run to bottom, preliminary to deepening into the formation. In addition to finding oil, this wildcat discovered an approximate 1½ million cu. ft. per day gas flow in the Bow Island during November.

Some 4 miles south of Camrose town Bay Petroleum Corporation discovered 36°-gravity oil in the Viking sand, and found about 17 ft. of oil-productive zone. The well was running electrolog at last report this weekend. Bay 6-11 South Camrose, is in LSD 6, 11-46-20w4.

One of this week's Saskatchewan discoveries may be the most significant strike for that province to date. It came at a well in the Forget area, 90 miles southeast of Regina and 50 miles north of the United States line. Made by the Tide Water group, this find flowed 29½°-gravity oil from the Mississippian limestone formation. Although not officially reported, it is believed that between

(Continued on page 460)

Oklahoma

Springer Extension Well Completed at Cement

SPRINGER sand development in the Cement field of Caddo County has been expanded with the completion by Deep South Oil Co. of its 1 Yule-Johnson, SE SW SW 1-5n-9w. The well, located about a half mile northwest of the field's Springer sand discovery well, flowed 150 bbl. of 32°-gravity oil per day from a casing-perforated interval at 6,740-47 ft. The discovery well, Little Nick Oil Co. 6 Royce, SE NW NE 12-5n-9w, was completed about a year ago as a large gasser from a series of perforations from 6,010 ft. to 6,558 ft.

These wells are in the eastern sector of the field, where, in the immediate vicinity, Deep South has two other active Springer sand operations. About 7 miles to the northwest on the north flank of the western sector of the field, Magnolia Petroleum Co. is continuing tests of its 13 Niles, SW NW NW 36-6n-10w, where indications have been given of gas production in Springer sand, with top of the Springer zone at 8,790 ft. Latest tests have been in zones above the Springer where possible gas production also is indicated.

A new Layton sand pool, located 7 miles northeast of Blackwell and 2 miles from nearest production in the East Blackwell district, western Kay County, appears to have been uncovered by C. L. Jenkins at his 1 Hansz, NW NW NE 33-28n-1e. Initially, the well flowed 35 bbl. of oil per day natural through 5½-in. casing. After acidizing, it increased its flow to 100 bbl. per day, showing some water. After a formation-fracturing treatment, it flowed by heads 125 bbl. of oil and 80 bbl. of water in 5 hours. Tubing now has been run, and the well is being put on the pump.

Phillips Petroleum Co. and Kerr-McGee Oil Industries, Inc., have completed their 1 Villines, oil-discovery well located 6 miles west of Wanette, in Pottawatomie County. Spot location is in the SW SE NE 31-6n-2e. The well, producing from Viola lime and Simpson dolomite, opposite which casing is perforated in a series of intervals from 5,379 ft. to 5,570 ft., flowed 148 bbl. of 37°-gravity oil in 24 hours through 13/64-in. choke on completion gage. It opens the Southeast Red Spring pool.

H. E. R. Drilling Co.'s new Layton-sand discovery well, 1 Ficken, NE NE NE 17-18n-4w, a mile west of other new Layton sand development in and along the west side of the old Lovell field, in Logan County, flowed 165 bbl. of oil per day through chokes while still cleaning. Some fresh water showed. Layton pay is open through casing perforations at 4,608-16 ft.

OKLAHOMA SUCCESSFUL WILDCATS

Seminole County: Kay Emerick 1 Foster, NW SW NE 3-5n-6e, pumped 15 bbl. of lio from 1,935-45 ft., TD 2,165 ft.

Washita County: Shell 1 Adams Comm., C SE SE 6-9n-19w, flowed 28 bbl. of 55.3°-gravity oil and 2,018 M.c.f. of gas from 11,066-92 ft., 11,362-392 ft., TD 12,500 ft.

OKLAHOMA WILDCAT FAILURES

Garfield County: Russell Maguire 1 Prusa, SE SE SE 24-21n-3w, dry, TD 5,493 ft.

Hughes County: Williams Drilling Co.-K. Nix 1 Gaddy, SW SW NW 2-5n-10e, dry, TD 1,202 ft.

A Ben Chadwell 1 Bailey, NE NW NE 20-7n-11e, dry, TD 1,955 ft.

Kay County: Mack Oil Co. and Amerada

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O. H. Parker 1 Kahle, NW NW SW 18-28n-2e, dry, TD 4,055 ft.
Lincoln County: A. A. Cameron et al 1 Purcell, SE SE NW 24-14n-2e, dry, TD 5,265 ft.
Murray County: C. L. Carlock 1 Greer, NE NW NW 1-1s-1e, dry, TD 2,001 ft.
Okfuskee County: R&R Oil Co. 1-A Jones, NE NE NW 1-12n-9e, dry, TD 3,103 ft.
Osage County: W. H. Elson 1 Osage, SE SE NW 20-23n-6e, dry, TD 3,106 ft.
Ingersoll & Ikenberry 4 Osage, SW SE SE 24-23n-9e, dry, TD 395 ft.
Republic Natural Gas Co. 1 Osage, NW NW NW 22-26n-4e, dry, TD 3,365 ft.
Pawnee County: Sinclair Oil & Gas Co. 1 Embry, SW SW NW 29-21n-6e, dry, TD 3,627 ft.
Payne County: Arrow Drilling Co. 1 Holland, SE SE NW 6-20n-4e, dry, TD 3,865 ft.
Tillman County: Marcel J. Silberman 1 Hoover, SW SW NE 25-1n-18w, dry, TD 971 ft.
S. D. Johnson 1 Ille, NW NW NE 26-3s-15w, dry, TD 4,035 ft.

Kansas

Pawnee County Wildcat Produces in Swab Test

M B. ARMER'S new rank-wildcat oil-discovery well 1 Ellis, SE SE NE 9-20s-19w, in northwestern Pawnee County, is being put on the pump for completion following a 2-hour swabbing test which recovered 15 bbl. of clean oil. Prior to swabbing, oil rose 3,230 ft. in the hole in 21 hours from a total depth of 4,222 ft. Pay is the conglomerate zone, topped at 4,200 ft. Bottom 2 ft. is in open hole. Casing also is perforated at 4,218-20 ft., 4,211-16 ft., and 4,204-09 ft. Nearest other production is in the Rutherford pool, 16 miles to the east, on the west side of the Central Kansas Uplift development.

In western Stafford County, Westgate-Greenland Oil Co. is opening a new Viola pool at its 1 Copeland, NW SW SW 2-23s-14w, now being completed on the pump after a 4-hour swabbing test which recovered 75 bbl. of oil. Pay is open through casing perforations at 3,640-50 ft. Hole is plugged back from Arbuckle lime, logged at 3,942-4,050 ft., which failed to show. Location is 6 miles north of St. John, and 1¼ miles east of the Crissman North pool.

W. J. Coppinger and D. R. Snow 1 Fitzsimmons, a wildcat located in the SE SE NW 30-27s-13w, 2 miles northeast of Pratt, in Pratt County, recovered 1,200 ft. of oil without any water in a 60-minute drill-stem test at 4,053-75 ft. in Lansing lime, topped at 3,835 ft. A later test at 4,260-70 ft., in the Mississippian, topped at 4,262 ft., got 20 ft. of oil-cut mud. Hole is being carried to the Arbuckle. Nearest production is 5 miles to the northeast in the Iuka-Carmi field.

KANSAS SUCCESSFUL WILDCATS

Ellis County: National Cooperative 1 Cave, SE SE NW 8-11s-18w, pumped 182 bbl. of oil from Lansing-Kansas City 3,328-38 ft., TD 3,598 ft. (opens Cave pool).
Finney County: Cooperative Refining 1 Sonderegger, NE NE NE 21-22s-31w, pumped 295 bbl. of oil from Cherokee 4,705-48 ft., TD 4,968 ft.
Marion County: Anderson-Prichard-Deiter 1 Wasemiller, NW NW SE 23-19s-1e, flowed 2,500 M.c.f. of gas from Mississippian 2,770-75 ft., TD 3,313 ft.

Stafford County: Westgate - Greenland 1 Batchman, SW NE NE 9-23s-14w, pumped 282 bbl. of oil from Lansing-Kansas City 3,668-77 ft., TD 4,058 ft. (opens Crissman North pool).

KANSAS WILDCAT FAILURES

Barber County: Transit Corp. 1 Medicine Lodge Peach Treaty, NE NE SE 7-32s-11w, dry, TD 4,445 ft.

Barton County: Hanlon & Boyle 1 Prosser, SE SW SW 12-19s-13w, dry, TD 3,535 ft. Hilton Drilling Co. 1 Walters, NE NE NW 8-20s-12w, dry, TD 3,433 ft.

Comanche County: Huber 1-A Ellis, CNL NW NW 1-32s-20w, dry, TD 5,240 ft.

Cowley County: E. F. Wakefield 1 Ebert, NE NW NW 19-32s-4e, dry, TD 3,502 ft. Lindas 1 Daves, NW NW SE 9-33s-4e, dry, TD 3,256 ft. Spencer & Tobias 1-A Gotlob, NE NE SW 2-34s-3e, dry, TD 2,663 ft.

Decatur County: Musgrove 1 Woodward, NW NW SW 21-3s-26w, dry, TD 4,107 ft.

Ellis County: Great Lakes Carbon 1 Gerstner, NW NW SW 24-14s-17w, dry, TD 3,496 ft.

Graham County: E. K. Carey 1 Evans, SW NW SE 3-8s-24w, dry, TD 3,812 ft. Jones, Shelburne & Farmer 1 Wehby, NW NW SE 26-10s-23w, dry, TD 4,092 ft.

Greenwood County: Kansas Oil Co. 1 Moore, NE NE NE 12-26s-8e, dry, TD 2,540 ft.

Kingman County: D. R. Lauck 1 Alexander, SW SE SE 30-28s-7w, dry, TD 4,640 ft.

Lane County: Murfin Drilling Co. 1 Bailor, SE SE SE 16-16s-28w, dry, TD 4,585 ft.

Lyon County: B. Brack 1 Baker, NW NW SE 18-20s-10e, dry, TD 2,900 ft.

Pratt County: W. J. Coppinger 1 Swindler, SE SE NW 19-27s-13w, dry, TD 4,585 ft.

Sedgwick County: Bankoff 1 Jackson, SE SE SE 21-27s-2e, dry, TD 3,362 ft.

Stafford County: Westgate-Greenland 1 Carr, SW SE SW 10-22s-14w, dry, TD 3,870 ft. Champlin 1 Shinkle, NE NE SW 31-25s-12w, dry, TD 4,330 ft. Helmrick & Payne 1 Boylan, SE SE SE 32-25s-14w, dry, TD 4,534 ft.

Sumner County: Four States 1 Miller, NW NW NW 19-34s-2e, dry, TD 3,960 ft.

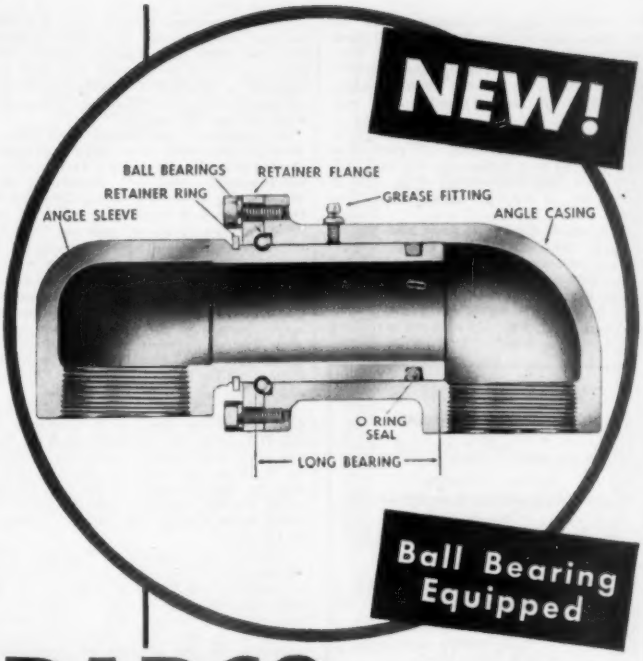
Rocky Mountain

Denver Basin Off to High Success Ratio For 1953

DENVER.—The Denver-Julesburg basin of Colorado and Nebraska has opened 1953 with the best success ratio of any comparable Rocky Mountain area. Since the first of the year four apparent discoveries have been made in Kimball County, Nebraska alone, and a pair of wildcat successes are testing in Colorado.

In the Kimball area of Kimball County, Anderson-Prichard Oil Co., Rogers Oil Co., and Bert Wheeler, independent swabbed at the rate of 150 bbl. of fluid in 11½ hours from 1 State, NW NW NW 36-15n-56w, with water content ranging as high as 50 per cent, but reported decreasing as tests proceed. The operator continues to test this "J" sand discovery, which is producing from perforations between 6,329-39 ft. No drill-stem tests were successful in this wildcat, and casing was set and perforated on the basis of core analysis.

Also in this county, Harry Royster, Denver independent cored about 4 ft. of saturated sand in the "D," about 6 ft. from upper "J" and is reported pulling core from lower "J" zones at 1 Evertson, NE SE NE 12-16n-



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47w. Attempts to run drill-stem test of the "D" failed, due to difficulties similar to those encountered in the Anderson-Prichard, Rogers, Wheeler wildcat. The operator considers shows sufficient to warrant running casing. This wildcat is some 15 miles from production.

In the southern part of Kimball County, Forest Oil Co. has perforated "D" sand zones from 6,242-50 ft. in 1 Marcum, NW NW NW 27-13n-55w, and is swabbing at the rate of 5 to 6 bbl. of fluid per hour, 50 per cent water.

Southeastern Kimball County also has an apparent discovery. Leon Wondra, independent, recovered 550 ft. of oil, 180 ft. of oil-cut mud and 270 ft. of muddy water on 1-hour test of the zone 6,206-33 ft. at 1 Alley, SW SW NW 1-12n-55w. The wildcat is bottomed at 6,233 ft., and operator is running logs.

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These discoveries, coupled with a 25,000 bbl. per day pipe line to connect Kimball with the Platte Pipe Line at Gurley, Nebraska which is to be built this year are expected to produce a record rate of development drilling as well as new exploratory work through this county.

In Colorado a southeastern Weld County discovery may prove to be one of the major developments in this basin. Twin Oil Co. has cemented casing at 2 Cuykendall, NW NW SW 12-2n-63w, 35 miles northeast of Denver. The well made 6,934 ft. of oil and 90 ft. of heavily oil-cut mud on 2½-hour drill-stem test of the "J" sand, which was topped at 7,012 ft. This important wildcat represents the most southwesterly extension of the producing trend through northeastern Colorado. This area, which approaches the deeper portion of the basin has not had a great deal of previous attention. Twin Oil drilled one previous well in the immediate vicinity, which had shows in the "J" sand which were not of commercial caliber.

In Logan County, Colorado, Wheeler and Gray are coring ahead at 1 Giacomini, C NE NW 21-9n-52w, northeast of West Padroni pool, after testing an estimated 4 million cu. ft. of gas per day from the zone 4,495-4,507 ft., and an additional flow of 2,800,000 cu. ft. per day from the interval 4,507-27 ft. These shows were in "D" sand. "J" remains to be tested.

Current new locations in Wyoming fields exceed those of any other mid-winter period in history, giving weight to predictions of the best year ever for this state, particularly in development drilling. New crude outlets furnished by the Platte Pipe Line are responsible for the upswing in development work.

Ten new locations were announced for the Little Buffalo basin, Grass Creek and Sage Creek fields of the Big Horn basin. In the Powder River basin the Sussex-Meadow Creek area in Johnson County had seven new locations staked as Continental Oil Co. started a development program to Tensleep. Production in Tensleep was discovered in May of 1951, with only a moderate amount of development work done since discovery.

On the east side of the basin three locations were announced for the general Clareton area of Weston County where a recent good Newcastle discovery has spurred new interest.

The U. S. Navy is drilling a new Tensleep test on the Teapot Dome Naval Reserve, first activity on the reserve in several months.

Interesting Wyoming wildcats include the announcement by Stanolind Oil & Gas Co. of a test to Madison in the Beaver Creek field of Fremont County. The well is No. 29-M, SE NW 11-22n-96w. Discovery was made in this field in 1938. It has produced gas from Morrison, and oil from Tensleep and Mesaverde. The current Madison test will mark the first well to be drilled to that formation.

Ohio Oil Co. has run casing at 1 Unit, NW NE SW 22-22n-85w, in the Cedar Ridge area of Carbon County, with total depth at 10,135 ft. The well is a tight hole, with no information other than depth announced. The wildcat was scheduled as a test of Sundance, at about 9,500 ft. Formations to be tested following perforations are not known.

In the Spring Creek anticline area of Park County, The California Co. has recovered oil-cut mud with some water from Tensleep at 1 Rawhide unit, NW SW SE 4-48n-101w, and is coring ahead below 5,271 ft.

Williston basin interest currently centers on two Montana and two North Dakota areas. Sun Oil Co. and Phillips Petroleum have cored additional stained lime at 1 Dynneson, C SW NE 32-24n-58e, northwest of Sidney, Richland County, Montana. The well is at 9,672 ft. Zones cored were generally lacking in porosity, and drill-stem test from 9,580-9,672 ft. produced only 410 ft. of slightly oil and gas-cut salt water. Operators are drilling ahead below 9,672 ft.

Northwest of the Sun-Phillips wildcat, Williston Pioneer Oil and Deardorf & Shepherd recovered 125 ft. of heavily oil and gas-cut mud on 2½-hour test of Charles from 6,988-7,006 ft. at 1 Pohle, C NW SE 13-35n-55e, Sheridan County. This wildcat is now below 7,269 ft. It is east of a recent failure in the Four Buttes area of Daniels County which had shows of non-commercial nature in Devonian.

Also in Montana, Shell Oil Co. has staked location for a wildcat 6 miles north of the recent Southwest Richey area discovery in McCone County. This is the third wildcat aimed at evaluating the considerable prospect in the vicinity of the discovery well.

In the Turtle Mountain area of Bottineau County, North Dakota, Zack Brooks and Crawford Smith have plugged back and reperforated at their apparent discovery, 1 Berentson, C SW SE 21-163n-80w. The well is now pumping at the rate of 8½ bbl. of oil per day from the zone 3,353-85 ft.

Three other wildcats in this general area are readying tests or waiting on material for completion after tests comparable to those on the discovery well.

First abandonment for the area since it became the most active wildcat area in the state following the Brooks-Smith discovery is Ray Murry-M. B. Monson's 1 Stravheim, SE SE 33-164n-79w, which proved noncommercial after test of zones below 3,147 ft.

East of Tioga field Amerada Petroleum Corp. is running logs at 1 Rice, C NE NW 23-158n-94w, 3-mile east extension in Mountrail County. The well went to 8,514 ft. and

(Continued on page 459)

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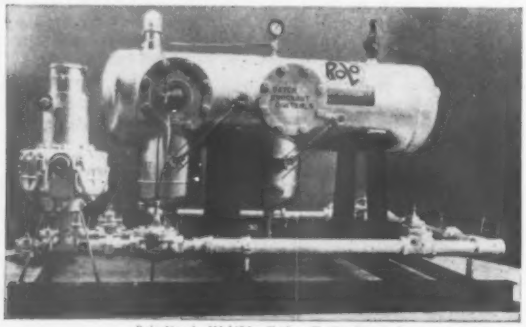

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Central Area

ILLINOIS

New production is indicated at two stepout tests on the east side of the Clay City Consolidated field. Midway between Mount Erie and Clay City, in the SW NE SE 23-2n-8e, and about ½ mile from production, John W. Rudy and Perry Fulk appear to have a well in Rosiclare lime at their 2 Freeman heirs. About 6½ miles to the south in the SE SW NW 25-1n-8e, also about ½ mile from production, Noah Petroleum Co. is testing McClosky lime at its 1 Farmer. Both are in Wayne County.

The Rudy and Fulk well, an old hole cleaned out and reworked, swabbed 20 bbl. of oil with 70 bbl. of water per hour, and now is being put on the pump. Pay is open through casing perforations at 3,040-44 ft. The Noah well swabbed 1 bbl. of oil per hour natural, but since has been acidized and at latest report was cleaning out. Its McClosky pay is open through casing perforations at 3,108-12 ft.

E. J. Cunningham's extension discovery well, 1 Downen, 5 miles southeast of Norris City, in White County, produced 102 bbl. of oil in 8 hours when put on the pump, and then was shut down for additional tankage. It produces from Benoist sand, opposite which casing is perforated at 2,893-2,902 ft. Location, in the NW SE SE 5-7s-9e, is ½ mile from production, being east of the Roland field and west of the Herald field.

Two miles to the southeast and ¾ mile southwest of production of the Herald field, Clarence Brehm is completing his 2 Bayley on the pump with production from Cypress sand at 2,606-26 ft. Swabbing tests after formation was fractured recovered 13½ bbl. of oil per hour. Spot is in the SW SE NE 16-7s-9e.

INDIANA

Hartman & Jordan's new Rosiclare discovery well, 1 Ellis & Aldrich, SE NW SE 33-5s-14w, 6 miles southwest of New Harmony, in western Posey County, is going on the pump for completion following swabbing tests in which it produced at the rate of 5 to 6 bbl. of oil per hour. Pay is open through casing perforations at 3,068-76 ft. and 3,084-92 ft. Total depth is 3,205 ft. in McClosky. Location is a mile south of production in the New Harmony South pool, across the Wabash River in White County, Illinois.

WESTERN KENTUCKY

Martin J. Gould 1 Orr, C S½ NE NE 25-K-19, a rank wildcat in southeastern Crittenden County, in the extreme western part of the state, swabbed 24 bbl. of oil per day while testing saturation encountered in McClosky lime at 1,044-48 ft. Location is 6 miles north of the Farmersville gas area in northern Caldwell County, nearest production of any kind. Crittenden County is far west of main oil development in the state.

In northeastern Hopkins County, adjoining Crittenden County on the east, James F. Secrest has a new oil discovery at his 1 Gailor, C NE NE 20-L-25. The prospective well is reported to have recovered 180 ft. of oil and 50 ft. of oil-cut mud in a 60-minute drill-stem test in Aux Vases sand at approximately 2,850 ft. Since the test, hole has been carried to McClosky lime, found unproductive, and now has casing run to complete in Aux Vases zone. Total depth in McClosky lime is 2,967 ft. Location, 10 miles

(Continued on page 459)

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THE OIL AND GAS JOURNAL

"Maybe I'd better find out who's in charge around here."

December Completions Show Decline

by John C. McCaslin

TOTAL December completions were down 164 wells from November's figures, and dropped 180 from December 1951 totals. Total footage drilled during the month was up slightly over November, but down considerably from December 1951. Operators finaled 1,690 oil wells during the month, down 87 from the preceding month, and completed 275 gas wells, down 17 from November. The number of dry holes also showed a decline from November, down 60.

December's 3,554 completions brought the 1952 total to 45,840 wells completed, up 3 per cent over 1951's totals. Of this total, 23,466 were oil wells, 3,255 were gas wells, and 19,119 were dry holes. Oil wells completed during 1952 showed only a slight increase over 1951. Gas wells finaled were up 225 over 1951, while dry holes increased by 1,086.

An 8.65 per cent increase in total footage drilled in 1952 was noted over 1951's figures. The industry dug 187,252,325 ft. of hole during the year as compared to 172,331,330 ft. in 1951. The over-all average footage drilled for all wells during 1952 showed a 5.5 per cent increase over 1951.

Completions in Texas, the nation's biggest oil-producing state, totaled 16,845 in 1952, with December having the lowest total of any month of the year. Operators had great success in completing new wells, completing 9,682 oil wells and 788 gas wells. North Central Texas was in first place with 5,540 completions, and West Texas ran second with 4,945 wells completed.

Oklahoma and Kansas were next in line after Texas, reporting 5,781 and 4,571 completions, respectively. Despite the lower number of wildcats drilled in the two states than in 1951, completions were up substantially, particularly in Oklahoma.

Completions were up in Louisiana and Alabama, but were down in Arkansas and Mississippi. Operators completed 2,385 wells in Louisiana in 1952 compared to 2,240 in 1951. The tri-state area of Illinois, Kentucky, and Indiana reported a total of 4,726 wells completed, compared to 5,102 in 1951. Pennsylvania and New York reported substantial increases over 1951's figures, recording 1,884 and 767 wells drilled, respectively.

SUMMARY OF COMPLETIONS, DECEMBER 1952

	Total comp.	Oil	Gas	Dry	Under 2,500 ft.	2,500-5,000 ft.	5,000-7,500 ft.	7,500-10,000 ft.	10,000-12,500 ft.	Over 12,500 ft.	Total footage	Rigs and drilling
New York	54	27	0	27	54	0	0	0	0	0	87,250	65
Pennsylvania	130	62	15	53	118	9	3	0	0	0	215,680	170
West Virginia	59	7	42	10	38	20	1	0	0	0	140,113	205
Maryland	1	0	0	1	0	0	1	0	0	0	7,162	6
Ohio	81	26	18	37	35	46	0	0	0	0	194,841	161
Kentucky	96	29	3	64	76	20	0	0	0	0	182,006	93
Illinois	176	67	1	108	60	116	0	0	0	0	457,778	307
Indiana	105	30	2	73	88	17	0	0	0	0	180,969	160
Michigan	53	20	2	31	28	21	4	0	0	0	143,316	110
Kansas	427	171	43	213	39	381	7	0	0	0	1,449,168	476
Nebraska	20	7	2	11	0	20	0	0	0	0	103,080	33
Oklahoma	487	264	25	198	160	218	81	19	9	0	1,761,779	991
Texas	1,119	581	71	467	199	415	300	151	42	12	5,633,886	1,188
N. Central (Dist. 7-B & 9)	396	198	3	195	130	185	80	1	0	0	1,404,499	299
West (Dist. 7-C & 8)	273	191	2	80	21	82	94	49	19	8	1,638,456	354
Panhandle (Dist. 10)	46	19	17	10	4	40	1	1	0	0	146,843	77
East (Dist. 5 & 6)	52	17	8	27	4	17	19	10	1	1	306,777	86
Gulf Coast (Dist. 2 & 3)	202	87	26	89	6	43	66	67	18	2	1,397,413	215
Southwest (Dist. 1 & 4)	150	69	15	66	34	48	40	23	4	1	739,898	157
Louisiana	200	103	15	82	58	31	22	31	43	15	1,251,920	291
North	101	52	10	39	52	27	12	5	5	0	313,872	95
South	99	51	5	43	6	4	10	26	38	15	938,048	196
Arkansas	44	20	0	24	6	31	6	1	0	0	150,379	38
Mississippi	28	5	0	23	0	1	22	2	3	0	148,110	36
Ala.-Ga.-Fla.	10	3	0	7	0	1	7	1	0	1	71,024	7
Montana	35	17	2	16	20	15	0	0	0	0	171,397	58
Wyoming	57	31	3	23	15	30	12	0	0	0	328,662	80
Colorado	42	7	2	33	6	18	18	0	0	0	218,965	66
Utah	8	4	1	3	1	1	6	0	0	0	52,247	28
New Mexico	91	49	27	15	28	24	25	14	0	0	505,389	195
California	208	152	1	55	55	83	49	9	8	4	885,176	272
North Dakota	16	8	0	8	0	3	13	0	0	0	124,261	25
Miscellaneous	¶7	0	0	7	4	0	2	0	1	0	35,161	§5
Total December 1952	3,554	†1,690	275	*1,589	1,088	1,521	579	228	106	32	14,499,719	‡5,066
Total November 1952	3,718	1,777	292	1,649	1,197	1,519	611	266	102	23	14,338,405	5,090
Total December 1951	3,734	1,947	278	1,509	1,100	1,516	727	262	96	33	15,472,266	5,851
Cumulative 1952**	45,840	23,466	3,255	19,119	14,201	18,385	8,033	3,526	1,354	341	187,252,325	
Cumulative 1951	44,516	23,453	3,030	18,033	14,738	18,455	7,363	2,638	1,082	240	172,331,330	
Alberta, Canada:												
December 1952	117	85	6	26	9	73	33	2	0	0	473,326	
November 1952	148	75	28	45	58	45	42	3	0	0	535,465	
Cumulative 1952**	1,577	924	142	511	256	649	641	27	4	0	6,682,803	
Cumulative 1951	1,234	768	111	355	147	568	496	17	6	0	5,220,085	

*Incl. 102 service wells: N. Y. 26, Pa. 47, Ohio 8, Ky. 6, Mich. 3, Okla. 10, N. Cent. Tex. 1, Calif. 1. †Incl. 24 condensate wells: W. Tex. 4, E. Tex. 3, Tex. Gulf Coast 10, S.W. Tex. 3, S. La. 4. ‡Incl. all wells rigged up and/or drilling at month end. §Incl. S. D. 2, Ariz.-Idaho-Nev. 3. ¶Incl. S. D. 4 dry, 8,982 ft., Idaho 2 dry, 14,636 ft., Nev. 1, 11,543 ft. **Revised.

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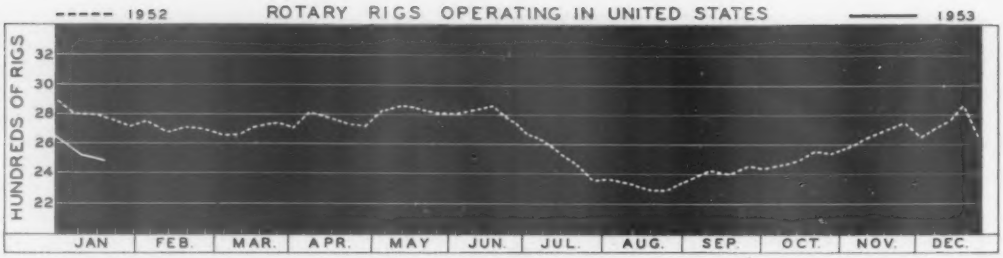
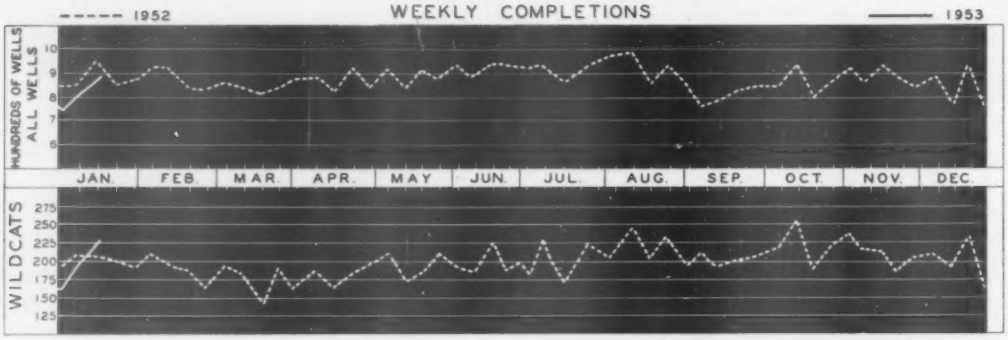




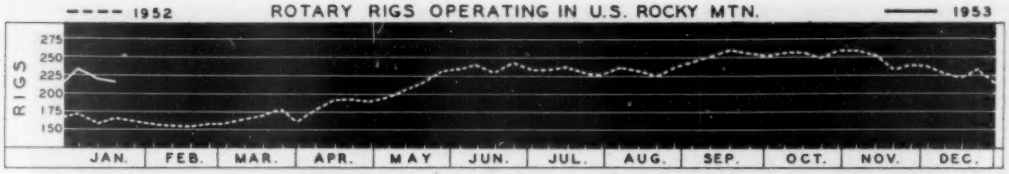
CURRENT STATISTICS

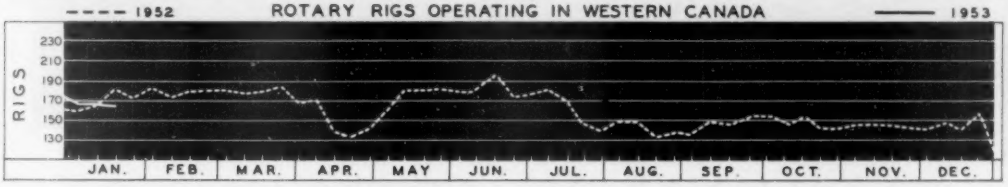
EXPLORATION

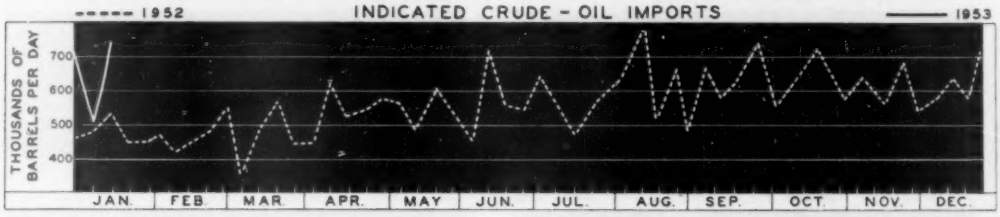
WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 17, 1953

	Total of all wells					Jan. 17		Wildcat completions and discoveries					Cumulative total, 1953				
	Comp.	Oil	Gas	Dry	Footage	1953	1952	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	13	7	0	*6	21,810	32	17	0	0	0	0	0	0	0	0	0	0
Pennsylvania	32	15	3	†14	53,920	80	72	0	0	0	0	0	0	0	2	3	5
West Virginia	4	0	4	0	14,315	16	32	0	0	0	0	0	0	0	0	0	0
Ohio	19	8	2	9	38,277	36	43	0	0	0	0	0	0	0	0	0	0
Indiana	27	9	3	15	50,960	71	49	0	0	1	5	6	2	0	1	11	14
Kentucky	22	8	0	14	41,711	69	55	0	0	0	7	7	4	0	0	14	18
Illinois	41	19	1	21	106,416	117	83	0	0	0	6	6	1	0	0	21	22
Michigan	12	5	0	7	27,228	34	26	1	0	0	4	5	3	0	0	11	14
Kansas	96	34	8	54	338,855	176	272	3	0	1	21	25	5	0	1	41	47
Nebraska	1	1	0	0	5,700	12	17	0	0	0	0	0	0	0	0	5	5
Oklahoma	135	79	5	‡51	479,044	282	340	1	1	0	15	17	2	1	1	26	30
Texas	293	143	10	140	1,440,548	633	774	21	1	6	83	111	36	4	9	175	224
North Central (Dist. 7-B & 9)	98	39	1	58	334,309	197	255	8	0	1	32	41	17	0	1	64	82
West (Dist. 7-C & 8)	56	43	0	13	318,162	135	204	3	0	0	10	13	4	0	0	29	33
Panhandle (Dist. 10)	2	0	0	2	11,011	23	29	0	0	0	2	2	0	0	0	2	2
Eastern (Dist. 5 & 6)	14	3	0	11	66,057	23	30	0	0	0	6	6	0	0	0	9	9
Gulf Coast (Dist. 2 & 3)	61	28	5	28	382,088	121	134	8	0	2	14	24	8	0	3	38	49
Southwest (Dist. 1 & 4)	62	30	4	28	328,921	134	122	2	1	3	19	25	7	4	5	33	49
Louisiana	78	49	6	23	545,563	153	114	3	0	1	14	18	4	1	1	20	26
Northern	33	19	3	11	133,411	80	60	0	0	0	7	7	1	0	0	12	13
Southern	45	30	3	12	412,152	73	54	3	0	1	7	11	3	1	1	8	13
Arkansas	10	5	0	5	40,004	21	21	0	0	0	2	2	1	0	0	6	7
Mississippi	9	3	0	6	71,280	21	19	1	0	0	2	3	2	0	0	9	11
Southeastern States	2	0	0	2	10,218	6	1	0	0	0	2	2	1	0	0	6	7
Montana	5	3	0	2	20,332	21	13	0	0	0	1	1	0	0	0	3	3
Wyoming	7	1	0	6	27,377	28	32	0	0	0	3	3	0	0	0	9	9
Colorado	11	3	0	8	60,786	29	18	0	0	0	8	8	0	0	0	19	19
Utah	2	0	1	1	10,053	6	3	0	0	0	1	1	1	0	0	3	4
New Mexico	24	4	16	4	122,445	63	55	0	0	0	3	3	1	0	1	4	6
California	47	37	0	10	189,986	107	114	1	0	0	9	10	1	0	0	22	23
North Dakota	6	4	0	2	44,965	10	1	0	0	0	2	2	0	0	0	2	2
Miscellaneous	0	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0
Total United States	896	437	59	400	3,761,793	2,024	2,176	31	2	9	188	230	64	6	16	410	496
Total previous week	820	391	70	359	3,107,987			25	4	4	165	198	33	4	7	222	266
Total January 19, 1952	861	409	87	365	3,504,570			21	1	3	177	202	75	4	12	457	548

Service wells included: *6, †11, ‡1.





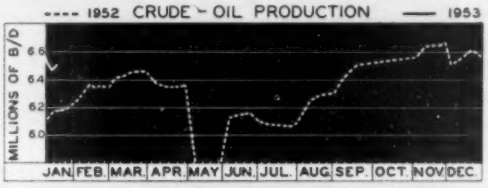


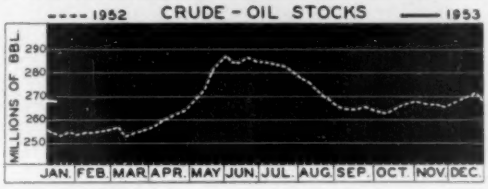
DAILY AVERAGE PRODUCTION FOR WEEK

	January 17, 1953			Jan. 10
	Crude oil	Lease condensate	Total	total
Alabama	3,800	.....	3,800	3,600
Arkansas	75,950	650	76,600	77,050
California	993,900	.....	993,900	993,300
Colorado	87,300	.....	87,300	85,000
Eastern	54,800	.....	54,800	55,000
Florida	1,525	.....	1,525	1,525
Illinois	161,900	.....	161,900	162,300
Indiana	34,100	.....	34,100	32,900
Kansas	351,900	.....	351,900	315,300
Kentucky	29,800	.....	29,800	30,200
Louisiana	655,825	34,700	690,525	690,075
North	112,000	2,700	114,700	114,250
South	543,825	32,000	575,825	575,825
Michigan	33,500	.....	33,500	33,000
Mississippi	90,900	4,200	95,100	96,150
Montana	28,200	.....	28,200	27,300
Nebraska	12,100	.....	12,100	10,800
New Mexico	177,900	450	178,350	178,550
Oklahoma	529,600	.....	529,600	532,300
Texas	2,873,475	48,275	2,921,750	2,921,750
Dist. 1	37,100	250	37,350	37,350
Dist. 2	161,500	5,200	166,700	166,700
Dist. 3	474,250	25,200	499,450	499,450
Dist. 4	257,850	5,900	263,750	263,750
Dist. 5	52,525	350	52,875	52,875
Dist. 6	125,700	5,100	130,800	130,800
East Texas field	262,500	.....	262,500	262,500
Dist. 7-B	111,800	100	111,900	111,900
Dist. 7-C	170,725	5,300	176,025	176,025
Dist. 8	952,275	350	952,625	952,625
Dist. 9	187,500	500	188,000	188,000
Dist. 10	79,750	25	79,775	79,775
Utah	5,300	.....	5,300	5,200
Wyoming	215,000	.....	215,000	206,500
North Dakota	11,200	.....	11,200	10,500
Total U. S.	6,427,975	88,275	6,516,250	6,468,300
Change from previous week			up 47,950	.....
Canada	145,000	.....	145,000	143,475

Total U. S. production January 1-January 17 .... 110,479,150 bbl.
Same period last year (crude plus cond.) ..... *105,469,305 bbl.

*Includes 1,610,490 bbl. condensate.



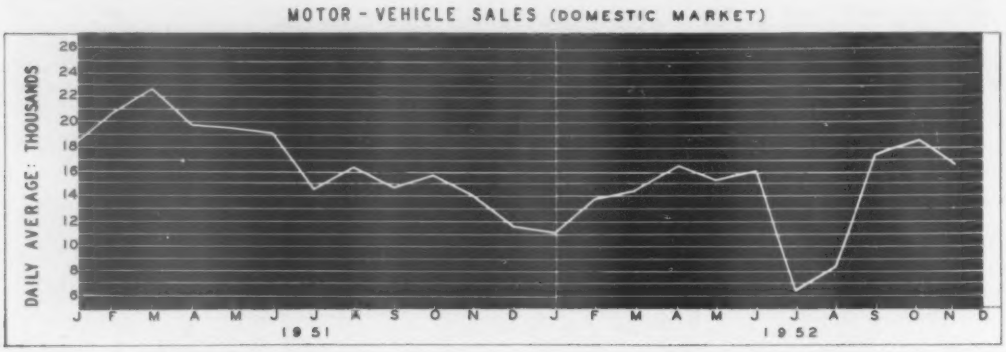


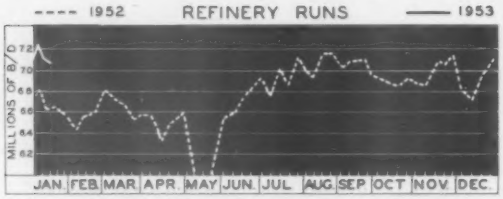
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

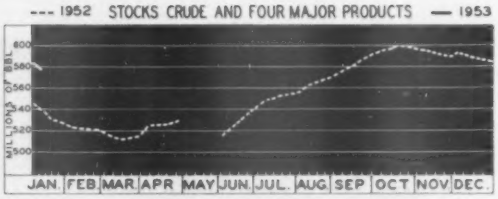
(Thousands of barrels)

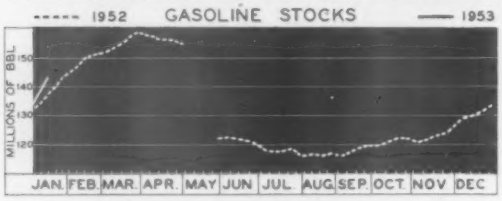
	Jan. 10, '53	Jan. 3, '53	Jan. 12, '52
Pennsylvania Grade	2,265	2,204	1,990
Other Appalachian	1,823	1,701	1,719
Illinois, Indiana, Michigan	10,818	11,369	11,942
Arkansas	3,332	3,420	2,954
Louisiana	30,071	15,730	13,367
North	2,523	2,583	2,785
Gulf	12,917	13,147	10,582
Mississippi	3,143	3,154	3,402
New Mexico	7,374	7,342	7,110
Oklahoma and Kansas	34,847	35,440	40,589
Texas	134,040	134,034	121,211
East Texas proper	11,023	11,358	11,522
West Texas	61,899	61,850	53,758
Texas Gulf	26,444	25,631	25,391
Other Texas	34,674	35,195	30,540
Rocky Mountain	14,631	14,226	13,731
California	31,731	32,041	29,170
Foreign	8,434	7,619	6,431
Total	267,878	268,280	253,616

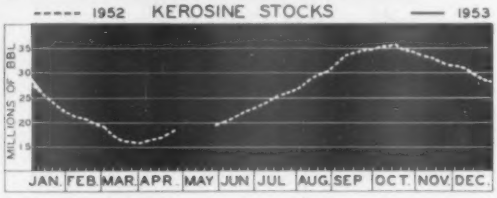
*Bureau of Mines.

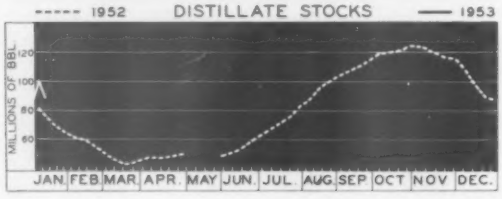


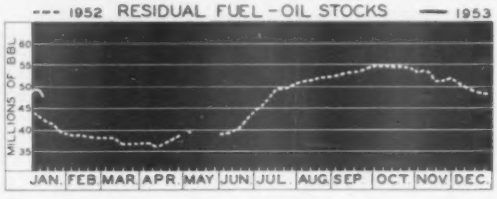










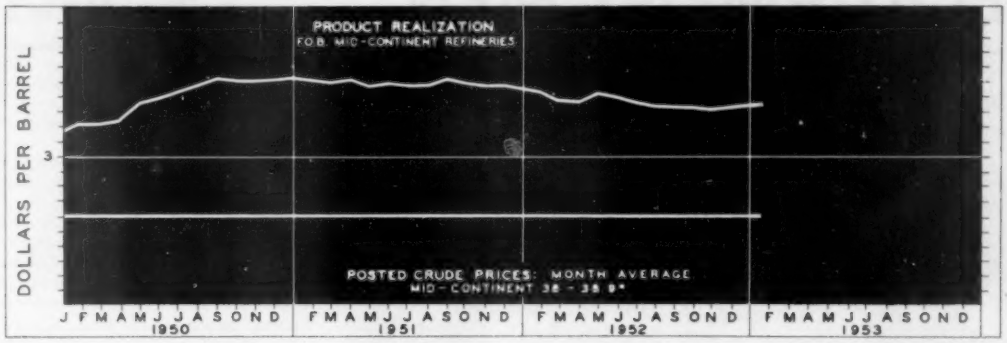


A.P.I. REFINERY REPORT, JANUARY 17

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, January 1952: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,095	467.9	42.4	271.7	264.6	32,933	10,733	32,390	12,395	966	387.9	48.6	244.9	248.4
Appalachian:														
District 1	118	51.6	10.3	14.9	18.7	4,155	472	1,443	677	108	48.3	5.3	18.1	15.1
District 2	95	49.0	7.9	16.7	16.7	1,863	303	583	179	85	40.1	5.8	13.6	18.6
Ind., Ill., Ky.	1,315	688.0	95.0	260.1	191.8	31,785	5,772	15,245	4,855	1,272	648.3	90.9	240.0	187.6
Okla., Kans., Mo.	575	322.6	14.1	148.1	56.4	15,811	1,462	9,856	1,349	529	299.1	17.4	129.0	67.1
Inland Texas	281	187.9	13.4	34.9	44.9	5,748	377	1,550	1,097	241	163.7	13.5	35.2	40.2
Texas Gulf Coast	1,747	841.3	127.0	428.6	256.6	20,448	2,545	10,311	6,674	1,651	752.4	148.7	408.5	260.8
La. Gulf Coast	553	253.7	66.7	128.1	61.4	6,922	1,842	3,982	1,862	515	218.1	68.1	122.6	62.4
N. La. and Ark.	83	34.4	8.0	21.6	7.9	2,593	716	908	111	78	33.9	8.7	18.9	7.4
Rocky Mountain:														
New Mexico	17	10.6		2.9	3.9	162		59	33	17	10.4	0.6	2.5	4.0
Other Rocky Mtn.	230	113.1	5.0	49.6	41.4	5,143	331	1,620	944	232	109.1	8.4	48.6	51.0
California	972	413.8	8.9	180.4	324.7	15,781	379	10,736	17,569	946	382.4	4.6	174.3	375.6
Jan. 17, 1953	7,081	3,433.9	398.7	1,557.6	1,289.0	143,344	24,932	88,683	47,745	6,640	3,093.7	420.6	1,456.2	1,338.2
Jan. 10, 1953	7,117	3,395.4	440.0	1,557.1	1,335.7	140,741	26,234	94,323	48,876					
Jan. 19, 1952	6,639	3,150.9	410.3	1,372.3	1,303.0	140,941	24,060	75,356	41,059					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
DOLLARS PER BARREL
3
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 38 - 35.9°
J F M A M J J A S O N D
1950
F M A M J J A S O N D
1951
F M A M J J A S O N D
1952
F M A M J J A S O N D
1953

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.37 for week ended January 10, $3.36 for previous week, and $3.45 for January 1952. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of January 21, 1953. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10⅛-10½	12.125-12.75	10¾-11
Premium gasoline, 86-88 octane	11¼-11½	13.25-14.0	11¾-12
42-44 w.w. kerosine	8¾-9	10.5-10.65	9
No. 2 straw fuel oil	7⅜-8	9.6-9.65	8
No. 6 residual	$0.90-1.05	$2.00-2.15	$1.50-1.65

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	6⅞	6⅜	6⅝
Grade 18-55	8.25	7.75	8.0

LUBRICATING OILS
South Texas

200 vis., No. 2-3 neutral	13
750 vis., No. 3-4 neutral	16
2,000 No. 5-6 neutral	18-19

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	22-23
200 vis., No. 3 neutral, 0-10 pp.	12-13

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	32.5
180 vis., 0 p.t. neutral	31.5

WAX
Mid-Continent

132-134 A.M.P.	5.5

RESIDUAL-FUEL prices dropped on the East Coast and strengthened slightly in the interior.

Esso Standard Oil Co. announced a reduction in heavy-fuel prices on the East Coast averaging about 10 cents a barrel and ranging from a cut of 5 cents at Charleston, S. C., to a reduction of 11 cents at Boston. The cuts were effective as of January 15. The new posted price for either barge or tank-car delivery in New York Harbor is $2.00 per barrel, off 10 cents from the old quotation.

The price reduction covered East Coast points only and was a direct result of lower tanker rates. Spot tanker rates last winter moved up to 200 per cent over the Maritime Commission base, but current rates on dirty vessels have dropped below the MC base. At least one fixture for the Caribbean-East Coast run has been reported at MC minus 35 per cent. This was lower than the more general quotations of MC minus 25 per cent for shipments from the Caribbean and MC minus 10 per cent for the Gulf-East Coast movement. Clean-vessel prices range from 10 to 20 per cent over MC base for light products out of the gulf.

Residual prices at Gulf Coast points are unchanged, indicating that the East Coast cut was due to lower tanker rates and not to a general softening of the heavy fuel market.

The distress residual in the Mid-Continent that was selling at prices down to 75 cents for high sulfur has been shipped. Even the general market price has strengthened slightly. Material that was moving at about 85 cents early in the month now brings about 90 cents. Reports from the high-demand areas of the North Central states indicate that gas sales to industrial plants are much less than last winter. Most of these plants are turning to heavy fuel, and this extra business is adding a little strength to the inland residual market, shown in slightly higher prices.

CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif‡	Okla. homa, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.93			
19-19.9	1.98			
20-20.9	2.03	$2.25		$2.12
21-21.9	2.07	2.27		2.14
22-22.9	2.12	2.29		2.16
23-23.9	2.18	2.31		2.18
24-24.9	2.24	2.33	$2.56	2.20
25-25.9	2.30	2.35	2.58	2.22
26-26.9	2.36	2.37	2.60	2.24
27-27.9	2.41	2.39	2.62	2.26
28-28.9	2.46	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.57	2.45	2.68	2.32
31-31.9	2.62	2.47	2.70	2.34
32-32.9	2.68	2.49	2.72	2.36
33-33.9		2.51	2.74	2.38
34-34.9		2.53	2.76	2.40
35-35.9		2.55	2.78	2.42
36-36.9		2.57	2.80	2.44
37-37.9		2.59	2.82	2.46
38-38.9		2.61	2.84	2.48
39-39.9		2.63	2.86	2.50
40 and above		2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico.

Last general price change represented a 50-cent increase, effective December 6, 1947.

‡Standard Oil Co. of California.

FLAT CRUDE PRICES

Representative posted schedules per barrel.	
Kettleman Hills, California*	$2.80
Louisiana:	
Beauregard Parish	2.60
Cotton Valley (distillate)	2.85
Cotton Valley (crude)	2.70
Texas:	
East Texas	2.65
Pecos County (Yates)	2.35
Conroe	2.83
Van	2.48
Pennsylvania Grade:	
Bradford	4.25
Southwest Pennsylvania	3.82
West Virginia	3.76
Illinois Basin	2.77

*37°-37.9°.

EQUIPMENT MEN . . . in the News

Schlumberger Names Four Houston Appointments

L. A. ALLAUD

Four new appointments to the Houston headquarters of Schlumberger Well Surveying Corp. have been announced by W. J. Gillingham, executive vice president. They are: L. A. Allaud and H. A. Nystrom, technical assistants to the vice president, operations, and general services; R. K. Thies, assistant to the vice president, personnel relations, and Clark Edgecomb, assistant to the sales manager.

H. A. NYSTROM

C. EDGECOMB

Allaud began service with Schlumberger in 1936 at New Iberia, La., as an engineer. He has served as division manager in Wichita, and area manager in Tulsa. In 1948 he was transferred to Surenco and served in South America. Since March 1952 he has been located in Fort Worth, serving as assistant to the Northwest Texas area manager.

Joining Schlumberger in 1937, Nystrom served in Louisiana and Texas before being assigned to Mt. Vernon as district manager. He was also district manager at Reed City and Mt. Pleasant, Mich., before being made assistant to the Northeast area manager at Mattoon, Ill. He served in the same capacity in New Orleans, and was then made division manager at Gretna, La.

Thies joined the company in 1939 and has served at Corpus Christi, Tex.; Houma and Lake Charles, La.; and Jackson, Miss. In 1945 he was assigned to Shreveport, and then at Tyler, Tex., as district engineer, where he stayed until his present appointment.

Edgecomb began with Schlumberger in 1943, and has worked in both Long Beach and Ventura, Calif. He has been district engineer at Ventura since March 1948.

Baash-Ross Names Bowcutt Rocky Mountain Manager

R. L. (Don) Bowcutt has recently been named by Baash-Ross Tool Co. as district sales manager for Rocky Mountain, and Western Canadian operations.

Bowcutt has been with the Baash-Ross organization for a number of years, most of them in the Rocky Mountain area. Before joining Baash-Ross, Bowcutt was prominent in oil-field operations with one of the major oil companies in Montana. His headquarters will continue at the company offices in Casper, Wyo.

Philips Export Named Agent for Hilliard

The Hilliard Corp., Elmira, N. Y., has announced the appointment of Philips Export Corp., 100 East Forty-second Street, New York, as its worldwide export representatives for the HILCO line of lubricating, fuel and industrial oil filters, and maintenance equipment. Philips is an old industrial corporation in the power plant and industrial equipment field.

Bissett Named by McEvoy Co.

McEvoy Co. recently placed E. L. Bissett in charge of the company's warehouse located at the Alice Specialty Co., Alice, Tex.

The maintenance of a warehouse in Alice enables McEvoy to have available for immediate shipment in that area requirements for oil-well completions, including gas-lift valves, McEvoy automatic lubricated gate valves, casing heads, tubing heads, and adapter flanges.

Bissett joined McEvoy in January 1952.

Collins Named General Manager for Glass Fibers

Thomas A. Collins, executive vice president of Glass Fibers, Inc., has been appointed general manager of the company, according to an announcement made by R. H. Barnard, president. In his new capacity Collins will coordinate production, sales, advertising and public relations activities.

Before coming with Glass Fibers, Collins served in various managerial capacities with Owens-Illinois Glass Co. for 26 years. Most recently he was general manager of its Kaylo division.

Collins will headquarter at the company's home office in Toledo.

Three Promotions Announced By Butler Manufacturing

J. D. HARMON

G. A. Burns, vice president, Butler Manufacturing Co., has announced the appointment of James D. Harmon, Jr., as oil-equipment sales manager for the Minneapolis division. Albert J. Campbell has been named assistant oil-equipment manager for the Minneapolis division, and Dale B. Horlitz has been appointed Minneapolis city sales representative in the oil-equipment division.

Harmon joined Butler at Kansas City in 1946 in the oil-equipment division and was assigned to the sales-engineering department. Early in 1951 he was transferred to Minneapolis and promoted to assistant sales manager for that area. In his new position, Harmon will be responsible for the sales of Butler oil equipment throughout the North and Northwestern areas.

Campbell began with Butler in Minneapolis as an office boy in 1935, later advancing to the city desk, and then as sales correspondent. In 1945 he was appointed Minneapolis city salesman for the oil-equipment division.

In 1947 Horlitz joined Butler as a sales representative, and has been traveling the southern Minnesota and northern Iowa territory. He formerly spent 14 years in sales work with Wood River Refining Co.

Diamond Power Elects Schueler Vice President

L. B. SCHUELER

Lyle B. Schueler has been elected vice president in charge of sales of the Diamond Power Specialty Corp., Lancaster, Ohio, according to an announcement by W. J. Fitzburgh, president. The board of directors made this promotion effective January 1.

Schueler has been sales manager of Diamond since early 1950. He graduated in mechanical engineering at University of Wisconsin in 1929 and entered the field of steam-electric power equipment production, and utilization. From 1940 to 1950 he was associated with American Gas & Electric Service Corp. as assistant chief mechanical engineer with major responsibilities in the design, construction, operation, and maintenance of all mechanical equipment on the properties of that system.

Lewis Named to New Post By Baroid Sales Division

Kemp S. Lewis has been appointed manager, mineral and chemical sales, by Baroid sales division, National Lead Co., Houston.

A chemical engineer and graduate of Rice Institute, Lewis joined Baroid as a service engineer in 1939. He served as district superintendent in the well-logging department in 1941 until entering the Navy in 1942. He rejoined Baroid in 1945 and was made a division superintendent in the well-logging department in 1949. Just prior to his current appointment, Lewis was handling Bentone sales, which will remain under his supervision.

Hostetter Is Appointed Divisional Sales Manager

Samuel K. Hostetter, Jr., has been named sales manager of the Crocker-Wheeler Division of Elliott Co. at Ampere, N. J.

Hostetter joined Elliott Co. in 1934. He was soon assigned to the Washington, D. C., office as field engineer on Elliott steam and electrical equipment. For the past 10 years, Hostetter has served as manager of the Washington office where he supervised Elliott sales activities in Washington and in an extensive surrounding territory.

Elliott Crocker-Wheeler Division, whose sales activities Hostetter will direct, is one of the oldest names in the field of electrical motors and generators, having been established in 1888. Crocker-Wheeler became a division of Elliott Co. in 1949.

Fluor Corp. Promotes Ellsworth and Lyon

M. A. Ellsworth, formerly vice president of the Mid-Continent area for The Fluor Corp., Ltd., has been

ELLSWORTH

L. R. LYON

appointed vice president and director of sales for Fluor. L. R. Lyon has been named as district sales manager of the Tulsa office.

Ellsworth will be headquarterd at Fluor's main office and plant at Los Angeles. He has been associated with the company for the past 11 years, and before that time he was affiliated with the H. H. Roths Co., and the Wheeling Steel Co.

Lyon was formerly district engineer for Fluor's Tulsa district sales office.

H. K. Porter Co. Elects Kemper Vice President

J. KEMPER

Jackson Kemper has been elected vice president, H. K. Porter Co., Inc., Pittsburgh, it has been announced by T. M. Evans, president.

Kemper will continue in his present capacity as general manager, Watson-Stillman Fittings Division of the Porter Co. located at Roselle, N. J. All operating and sales activities of this division are under his supervision. His background includes various engineering and sales positions with Yarnall-Waring Co., American Chain & Cable Co., and Birdsboro Steel Foundry & Machine Co.

Kold-Hold Names Glennon To Platecoil Division

Charles E. Glennon has been appointed sales engineer for the Platecoil Division of the Kold-Hold Manufacturing Co., according to an announcement by C. P. Yoder, division sales manager. Glennon comes to Kold-Hold from 6 years' experience as chief of the industrial division and production engineer for the Chicago chemical procurement district of the U. S. Army.

Glennon began his career with postgraduate work in metallurgy, engineering, and journalism. Following this he served 6 years as assistant to the chief inspector and engineer of tests at the Gary Works of Carnegie Illinois Steel Corp., where he was also a customer service representative.

(Continued on page 459)

Oakite Service Representatives Hold Annual Meet

Field service representatives from the Canadian, Chicago, New England, New York, and Philadelphia sales divisions of Oakite Products, Inc., manufacturers of specialized cleaning and allied materials, are shown as they gathered for a series of technical sales meetings at the Roosevelt Hotel in New York City, December 8-10. Featured at these meetings were reports from Oakite research chemists, service engineers, and technicians on recent developments in cleaning and related procedures designed to assist industry in combating rising operating costs.

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1 OILWELL Steam Pump. 16¼ x 7¾ x 20". This pump is in excellent condition, may be seen at Makin Drilling Company Yard, Hobbs, New Mexico. Makin Drilling Company, Box 1638, Hobbs, New Mexico.

FOR SALE: 8—Shriver 42"x42" cast iron Filter Presses, Plate & Frame type, 18, 27, and 54 chambers, 1" cake; 15—Sperry 18"x18" cast iron Filter Presses, 11 chambers; 2—#12 Sweetland Filters for 36 leaves on 4" centers. Immediate shipment. Attractively priced. Consolidated Products Co., Inc., 17-20 Park Row, New York 38, N. Y. BArclay 7-0600.

GAS METERS FOR SALE. Westcott, Foxboro and Emco. Good condition. Geo. R Milner, Box 124, Okmulgee, Oklahoma.

HOSE, STEEL REINFORCED RUBBER

9500 feet 4 inch, 30 foot lengths. Neoprene treated, brass couplings. 600#, working, 150#, suction, pressure. For sale, bargain price, New Mexico location.

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FOR SALE
PIPE CLEANER

Cleans 2" to 30", inclusive. American Wheelabrator. The latest and most unique of centrifugal blast cleaners for pipe. This machine can be purchased at a reasonable price, complete with all detachments, and can be seen in operation in Centralia, Ill. Cleans any degree of dirty or rusty pipe like new. This machine was new in 1951 and used very little.

For further information, contact Frank Corgiat or Frank Tye.

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Used Seamless
BOILER TUBES

Ideal for gas, water and air lines

2¼" O.D.
3¼" O.D.
3½" O.D.
4" O.D.
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Approximately 5 miles of each diameter available in single or double random lengths with beveled ends.

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FOR SALE: Six Type 80 Cooper Twin Compressors. Good Condition. Alfred B. Kern, 223 Wright Bldg., Tulsa, Oklahoma.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

WELL drilling equipment, new or used Spudders, rotaries, core & shot hole drills, tools, pipe, bits, blocks, pump jacks, valves. Everything for well drilling and service. Fishing tools rented. Pressey & Son, Pueblo, Colo.

RECONDITIONED Pumping Engines and Light Plants. XAHU Waukeshas, U-2 and U-4 Internationals, 1½ K.W. Kohlers. Completely rebuilt and guaranteed. These are bargains. Delk's Repair Service, Box 429, Great Bend, Kansas. Phone 4095.

FOR SALE: 40,000 ft. #1 3½" O.D. standard plain end line $0.55 per ft. 20,000 ft. 4" O.D. flues. Rogers Pipe and Supply Company, Phone 5-8850, Tulsa, Oklahoma.

COUPLINGS For Sale: 5,000 8⅝" O.D. Recessed Couplings, off of 28.55# pipe; priced $1.50 each; 2000 10¾" O.D. off of 41# pipe, recessed; 2500 12¾" O.D. recessed; all of the above 8V thread. All couplings cleaned and in first-class condition. A. A. Gilbert Pipe & Supply Co., P. O. Box 986, Shreveport, La.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-30 KW Generating Units.

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Phones: 133—Rockdale, Texas
AT-3427—Houston, Texas

API STANDARD EXTERNAL UPSET TUBING

We offer for sale a complete facility for finishing oil country drill pipe and tubing to API Specifications. Present setup is for 2⅜" O.D. API Standard External Upset Tubing. Range can be adjusted, with additional dies, to accommodate 1" O.D. to 5" O.D. tubing. Facility can be inspected in operation at our plant, Versailles, Pa. Write for descriptive prospectus.

Mr. W. J. Cornelius
A. B. MURRAY CO., INC.
P.O. Box 476, Elizabeth, New Jersey

EQUIPMENT FOR SALE

2 FAILING Model 1500 drills, shop number 966 mounted on KBS-7 1947 International truck, shop number 909, of special design mounted on GMC 6 x 6. Both drills in good condition and reasonably priced. Write for prices and list of equipment. Box G-193, The Oil and Gas Journal, Tulsa, Oklahoma.

DIESEL Electric Generator Unit like new. Total 746 hours operating time—37½ KVA, 3 Phase, 60 Cycle, 220/440 Volts, 1800 RPM, Century Generator, direct connected to 72 H.P. Model 6DTG317 B/M #DX976, Buda Diesel. Located on our Duconnon Lease, Section 26, T6N., Crawford County, Illinois. Price $3,000.00. Red Head Oil Producing Company, Brilliant, Ohio.

CASING—7" OD 26# Grade J55 Youngstown Range 3 with Hydril Speedite Threads, Streamline, 5300 feet, located Magnolia, Arkansas. Condition like new. Price OPS ceiling. Contact Sam Siegel, Phone 4-6512, Shreveport, Louisiana.

ENGINES FOR SALE

3—Bessemers Type X 200 H.P.
1—Clark 200 H.P.
1—Cooper Type 80, 170 H.P.
1—Bessemer Type X, 100 H.P.
30—Compressor Cylinders, Bessemers, Coopers and Clarks from 250# W.P. to 1750# W.P.
2—New and 1—Used Bessemer Type X Shafts.

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3350—H. P. DIESEL GENERATING PLANT

5—Cooper-Bessemer ENGINES 670-H.P. Each. Condition, Good. Can Be Inspected in Operation. Generator 3/60/2300-volt, Complete with Switchboards and Exciters. Complete Plant 2500-KW.

THIS IS AN EXCEPTIONAL OFFERING

Correspondence Invited.

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FOR SALE: R. L. Dubbledrum Cardwell fully equipped. Oklahoma City, Oklahoma. Melrose 8-5108.

USED ROTARY and cable tool drilling tools, wire lines. E. A. Kelly, 1540 S.E. 29th Street, Box 861, Oklahoma City, Phone 5-6407.

FOR SALE: TUBING COUPLINGS. 650 Pcs. 3" x 5¾" Lg. 8 Rd. Thd. Upset, 200 Pcs. 3" x 5⅞" Lg. 11½ V Thd. Pl. Tbg. All new, never used. Offered less than current prices. JULIUS M. FOGELMAN, 1649 Perkiomen Ave., Reading, Penna.

EQUIPMENT FOR SALE

6½" X 3⅜" X 5½" Gardner Denver Vertical Duplex two stage water cooled compressor. Happy cooler. Skid mounted with Waukesha engine. Located Walnut, Kansas. Call Dallas, Texas, RIverside 6811.

FOR SALE: 45 Star Heavy Duty Spudder with steel pipe. In A-1 Condition. With or without tools. Working now. C. H. Barker, Toronto, Kansas.

SULLIVAN 200 drill with drill pipe, tools and etc., ready to go in good condition. Inventory sent on request. R. F. Mesker, Box 6147, Tulsa, Okla. Phone 5-9357.

EQUIPMENT FOR SALE

SEISMOGRAPH water truck. FAILING built 700 gallon cap. Ford F-6. Located at FAILING'S Houston shop. Contact Eldon Eeds at LD 1, Beeville, Texas.

1189' of 2⅜ FAILING exploration drill pipe w/3" tool joints. Some premium grade. $2.50 per ft. F.O.B. Longmont, Colorado. P. O. Box 819.

EQUIPMENT WANTED

WANTED — 36L Bucyrus - Erie Spudder with top to bottom tools. Mail inventory and price to 152 N. Emporia Street, Wichita, Kansas.

TO RENT or purchase on rental basis, one complete 3000-4000 jack-knife rotary rig, 4½" drill pipe, 12" or 14" pump for use in Dallas area. Give description, location, age, price. Texas Water Wells, Inc., 951 McCarty, Houston, Texas.

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

WANTED: Three engine compound for Wilson Titan drawworks. Makin Drilling Company, Box 1628, Phone 3-3141, Hobbs New Mexico.

WANT LIGHT portable rotary drill complete, 2500 to 3000 ft. depth. Prefer truck mounted. T. R. Davis, 700 Mosley Street, Vidalia, Georgia.

HELP WANTED

CONSTRUCTION SUPERINTENDENT Construction and engineering firm has opening for experienced construction superintendent. Must have had at least ten years recent experience in the construction of Oil and Gas Process Facilities. Must be qualified to assume complete responsibility of entire projects under his supervision. Salary commensurate with experience and ability. Applicants must give complete resume of experience, education and former employers; also age and marital status, to Box G-286, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL ENGINEER for design and/or field installation of gas process equip. At least 2 years exp. in plant process or construction. Leading S. W. Manufacturer. Box G-279, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST for Caracas, Venezuela, to assist Chief Geophysicist. Must be fully qualified in interpretive work, field supervision, and correlating geophysical information from various sources. Will assist in planning and directing geophysical field program. Should have college degree in geology or geophysics and a number of years geophysical experience in a supervisory capacity. Liberal salary and living allowance. Give full details in reply to P. O. Box 2819, Dallas, Texas.

GEOLOGIST wanted to headquarter in Denver with independent oil company. Must have well sitting, sample examination and mapping experience, and at least two years experience in Rocky Mountain Area. Reply will be kept confidential. Box G-284, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL Industry Employment Service, 405 Tuloma Bldg., Tulsa, Okla. 4-5974. Tom Robinson, owner. For Technical and Trained Personnel, including LPG.

BOILERS:

HAVE A FINE STOCK AVAILABLE
of WATER TUBE, Code Boilers 150/400# psig: All Standard Sizes. Also Turbo-Generators, Boiler Feed Pumps, all Sizes & Pressures. Advise Your Steam Pressure and Size.
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COMPRESSOR STATION EQUIPMENT

The following units and equipment originally installed in 1949 have become surplus due to compressor station changes this year:

275 H. P. Ingersoll-Rand PVG Gas Engine direct coupled to G.E., 190 KW Alternator, 480 V., 3 phase, 60 cycle, with 128 V. exciter.

Westinghouse switchboard control unit for above 190 KW, A.C., engine generator set complete for generator and power service connection. Contains 600 Amp. incoming line and generator breakers, 6-225 Amp. feeders, with all meters and synchronizing equipment.

2 - Ingersoll-Rand 3RVH-5 pumps	1 - 300 GPM, 52' TDH 1 - 225 GPM, 55' TDH
1 - Ingersoll-Rand 3RVL-3 pump	225 GPM, 28' TDH
1 - Ingersoll-Rand 3RVL-5 pump	275 GPM, 31' TDH
2 - Smithway Vertical turbine pumps	300 GPM, 53' TDH
1 - Smithway Vertical turbine pump	400 GPM, 63' TDH

1 - Water Tank Cylindrical, 25' Diameter x 50' high, 183,000 gallons

The following items are various ages and quality offered subject to your inspection or inquiry concerning their condition. All of them were in service until this year.

11 - Shell and tube coolers, Style FST, 250 PSI W.P., Shell 705 sq. ft. surface, 75 PSI W.P. tubes.

2 - Shell and tube coolers, Style FST, 500 PSI W.P., Shell 705 sq. ft. surface, 75 PSI W.P. tubes.

Various tanks, gate valves, in sizes from 20" to 4", buildings from 20' to 126' long.

Following compressor cylinders for horizontal engines:

4 Transit Cylinders - 200 to 250 PSI W.P. 23" x 36"
4 Transit Cylinder Liners 27" x 36"
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14 Cooper Cylinders - 500 PSI W.P. 13½" x 36"

Following compressor cylinders for angle type engines:

15 Worthington Cylinders for LTC, 5 cyl., 200-250 PSI W.P. 12¾" x 15" with 15 distance pieces.
13 Clark cylinders for VTH, 300 PSI W.P. 12½" x 14"
9 Ingersoll-Rand Cylinders, 1000 PSI W.P. 8¾" x 14"

Send for complete list and description

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Major Oil Company has opening for graduate electrical engineer with 7-10 years experience, to take charge of planning, coordinating, and expediting of all electrical engineering and construction work in an operating district in Venezuela.

Write giving full details of experience, etc., to

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HELP WANTED

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A qualified applicant should:

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e) have experience in training and qualifying code welders.

Excellent salary, advancement and security. Travel is required. Outstanding opportunity with leading, progressive and expanding firm of engineers-constructors in petro-chem field with domestic and international activities.

Interviews arranged in New York at our expense. Arrangements for relocation of immediate families of selected applicants to NYC area.

Qualified applicants send complete detailed chronological resume, including salary history to Personnel Department:

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FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

SEISMIC PERSONNEL needed for United States and Canada by well known and expanding contract geophysical company. Address Box E-863, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER with storage tank, field, and drafting experience; wanted by well established company in Southwest. Good salary and future. Replies will be kept confidential. Box G-282, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST with Canadian or Rocky Mountain experience wanted by independent oil company to headquarter in Calgary. Replies will be kept confidential. Box G-265, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer. Young man preferably experienced water flooding for independent oil company, location North Texas. State experience fully. Salary expected Box G-251, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL SECRETARY: Age 35 to 45, for independent oil company in Oklahoma City. Must be expert stenographer, well experienced in oil production and operations. Must have excellent character and references. Sal. $350 per mo. with raises commensurate with ability. P.O. Box 1824, Oklahoma City, Okla.

WANTED: Experienced completion and production man to handle new field in Colorado having 12 producing wells at 5000 foot depths. Housing furnished. Reliable and financially strong concern. Give age, experience and salary desired. All replies confidential. Box G-285, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

YOUNG, aggressive, experienced Geophysicist with both contract geophysical and (present position) major oil company geophysical (supervisory) backgrounds wants a better, more challenging job in seismic exploration, U.S. or Canada. Box G-283, The Oil and Gas Journal, Tulsa, Oklahoma.

DETAIL clerk, stenographer, bookkeeper desires position with independent in Oklahoma City. Accepts responsibility, courteous, efficient, conscientious. Experienced in land, legal and drilling. Box G-278, The Oil and Gas Journal, Tulsa, Oklahoma.

CONSTRUCTION SUPERINTENDENT ENGINEER

Over 20 years experience with top ranking Contracting Engineers and Constructors, and Major Oil Company on refinery and pipe line projects, both domestic and foreign. Desire to make a change. Graduate Texas A. & M.

Box G-277
THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

HELP WANTED

SITUATIONS WANTED

GEOLOGIST: 1½ years experience with major oil company in Rocky Mountain area and Williston Basin. Experienced in Rocky Mountain surface, subsurface and well sitting in Wyoming and Williston Basin. Bachelor of Science degree in Geological Engineering. Box G-281, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No 1628. Ph. No. 3-3141, Hobbs, New Mexico.

GEOLOGICAL engineer, now employed, age 29, veteran 2½ years subsurface and well-sitting with independent. Prefer position in Rocky Mountains or West Texas-New Mexico areas. Box G-266, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, age 32, 7 years varied experience. Drilling and Production Gulf Coast area. Desire position with expanding organization. Box G-267, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Production Engineer. Age 32. Seven years major company experience in production and drilling operations. Desires responsible position with active independent. Box G-268, The Oil and Gas Journal, Tulsa, Oklahoma.

CPA wishes to make connection with progressive firm. Fully qualified, dependable. Would move to any location. Box 1324, Denver, Colo.

PILOT POSITION WANTED

Fully qualified and experienced executive pilot desires position with stable oil company. Highest character and ability references, age 37, married. Over 5000 hours experience domestic and overseas, including transocean. Box G-273, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 1950 graduate, 31, married, child, locate anywhere, limited experience, desires position requiring initiative, responsibility, integrity, hard work; offering opportunities for learning, acquiring practical experience, earning advancements. Box G-256, The Oil and Gas Journal, Tulsa, Oklahoma.

AGGRESSIVE landman and attorney. Four years experience. Desires connection with company or independent in job of responsibility and future. Excellent references. Box G-263, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Geologist, Age 47, married, now in consulting capacity, wishes to re-enter Oil Company, staff, research or coordination; subsurface geology, paleogeography, geophysics. Prefer foreign; would consider domestic. Box G-262, The Oil and Gas Journal, Tulsa, Oklahoma.

ELECTRICAL Supervisor, age 32, married. Experience: 15 years in design, construction, and operations. Now employed by major oil company. Desires change. Box G-284, The Oil and Gas Journal, Tulsa, Oklahoma.

ROYALTIES

PRODUCING royalty for sale, 1⅛ acres, paying approx. $155.00 per month, 4 wells, WILCOX SAND. Lease making approx. 12,000 bbl. oil per month. NW NW S27-T17N-R1E, Logan County, Okla. (Haynes Tract). Price $8,150.00. Box G-246, The Oil and Gas Journal, Tulsa, Oklahoma.

JACK EAGLE—Pay you immediately for your producing royalties and Overrides, absolutely no delay, send complete details 706 City Nat'l Bldg., Okla. City, Okla. REgent 6-7027.

ROYALTIES WANTED

Producing Royalties
High Grade Only
Send Full Particulars
Address

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719 World Bldg., Tulsa, Okla.
P.O. Box 2151

TWO INDICATED OILFIELDS
SW ROOSEVELT & SE DEBACCA, N. M.

Roosevelt—Wells drilled into San (Permian) Andreas show indicated production 2 zones. Offset to be drilled to shut in well sec. 31-2-31. DeBacca—Texas interests plan well north of Pennsylvania well which showed 3 million c.f.g. and distillate at 6350 ft. sec. 18-4-27. Engineering data on request. Some Over Ride Royalty and Leases close in.

W. J. PETERMAN, Geologist
Portales New Mexico

LEASE AND DRILLING BLOCKS

DRILLING Deals. See A. L. Bowles, Rollow Bldg., Ada, Okla.

RANCH for sale by owner. 4070 acres Edwards County, Texas. $27.50. Abundant deer, turkey, water. Considerable oil activity. One-half minerals available. P. O. Box 2714, Dallas, Texas. Telephone, Riverside 4994.

10,000 ACRES under lease in Pennsylvania near production and wildcat activity. Money needed for wildcat and development. Box 2, Clarendon, Pa.

DALLAM COUNTY, TEXAS: 8000 acres solid block one owner. ½ County leased to Major Companies. $1.25 bonus, $1.00 rentals. 10 year commercial lease. Combest Royalty Company, Amarillo, Texas.

WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

5000 ACRES-2800 acres GRAY COUNTY, TEXAS. Semi-proven oil and gas 3000'. Small cash bonus and little override. 5 year commercial lease $1.00 rentals. Combest Royalty Co., Amarillo, Texas.

SOUTH LOUISIANA & GULF COAST GEOLOGISTS

Ex-Company Landman representing substantial interests would like to hear from geologists with seismic or subsurface prospects that merit drilling. Excellent references. All replies strictly confidential. Box G-280, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

B. D. BUCKLEY
6635 Delmar Ave., St. Louis 5, Mo.

INCORPORATIONS

DELAWARE CORPORATIONS FORMED & SERVICED. Commonwealth Trust Co. P.O. Box 350, Wilmington, Delaware.

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OFFICE space for rent—building under construction—will make changes for tenant—all on ground floor—one block from main street, close in. Forced air heat—air conditioned — well lighted — total of 17 rooms — contact Adam L. Krause, 1319 Main, Great Bend, Kans.

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LEGAL

Sealed bids for oil and gas mining leases on 2,593.89 acres of trust lands on the Crow Indian Reservation, Big Horn County, State of Montana, will be received at the Office of the Superintendent, Crow Indian Agency, Crow Agency, Montana, up to 2:00 o'clock P.M., Montana Standard Time, February 10, 1953. For further information, call or write L. C. Lippert, Superintendent, Crow Indian Agency, Crow Agency, Montana.

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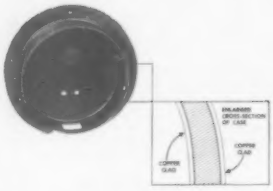

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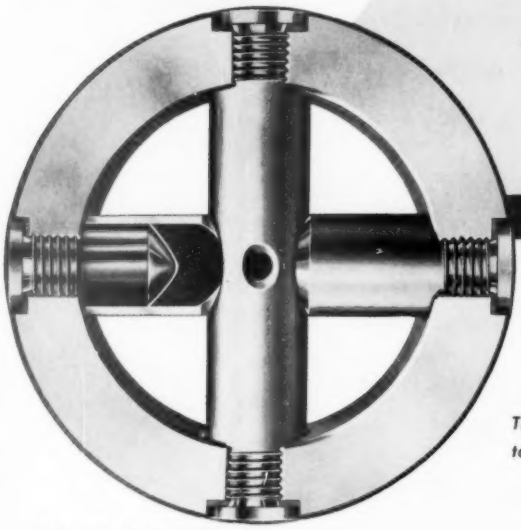

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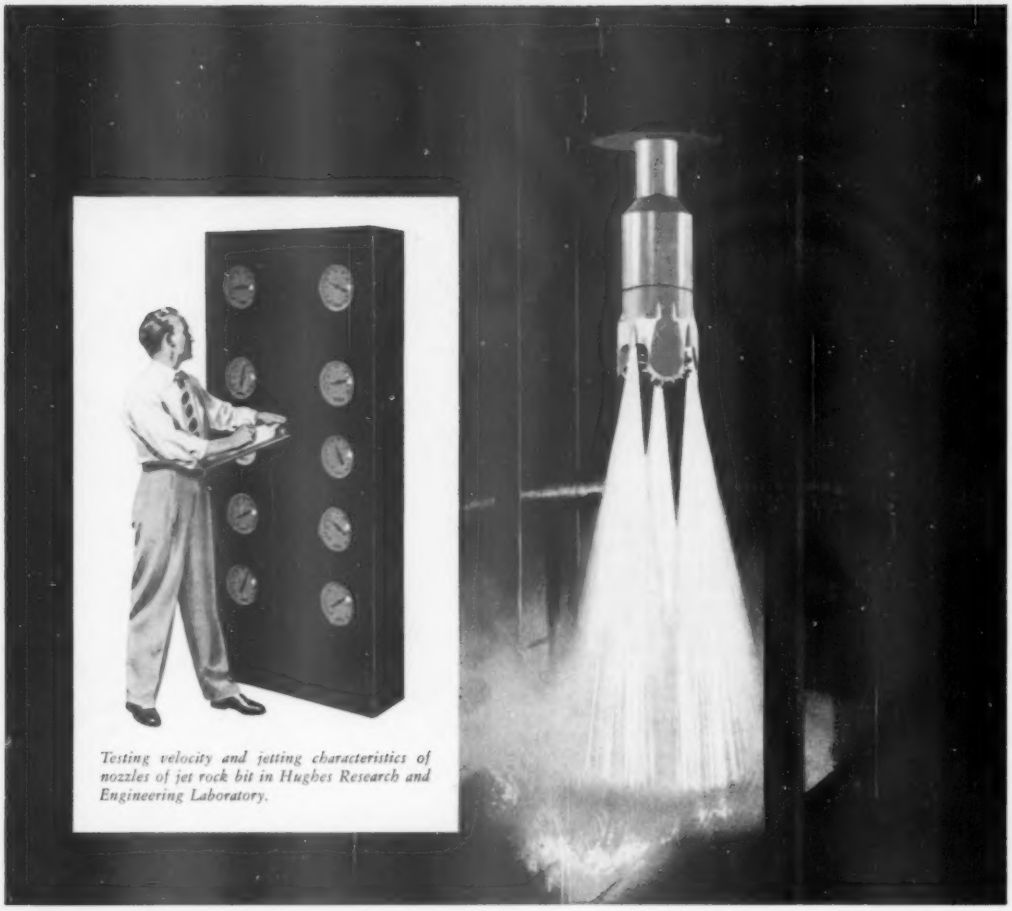

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